

VETERINARY
THERAPEUTICS

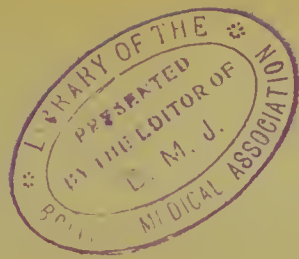
E. WALLIS HOARE



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VETERINARY THERAPEUTICS AND
PHARMACOLOGY

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A MANUAL
OF
VETERINARY THERAPEUTICS
AND
PHARMACOLOGY



BY
E. WALLIS HOARE, F.R.C.V.S.
EXAMINER IN ANATOMY, ROYAL COLLEGE OF VETERINARY SURGEONS

SECOND



EDITION

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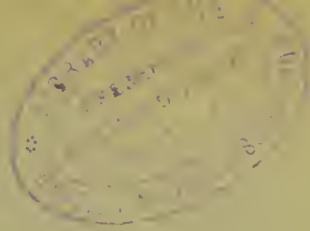
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PREFACE TO THE SECOND EDITION

IN this edition the entire work has been rewritten and enlarged. This course was necessary in consequence of the advances which have been made in veterinary therapeutics in recent years, and also because of the numerous errors and omissions that existed in the first edition. A decade of professional experience since the first edition was published has led the author to recognise more fully the importance of clinical therapeutics; hence in the present work he has deleted many theoretical details, and has introduced instead matters of a more practical and useful character in connection with the uses of medicinal agents and the principles of treatment.

The section on Diagnosis has been considerably extended, and a chapter on the Care and Management of Sick Animals has been added.

In Part II. the actions and uses of medicinal agents receive attention, and the toxic actions and antidotes of the more important poisons are briefly considered.

A brief outline only is given of the preparation of the various drugs, as there is a general consensus of opinion that this subject is of minor importance to the student of the present day. The time and energy that were formerly devoted to the acquisition of such knowledge are now far more profitably employed in studying the actions and uses of medicinal agents and their application in the treatment of disease.

Similar remarks will apply with reference to the characters and impurities of drugs, a knowledge of which is essential to the manufacturing chemist, but not to the practitioner.

In Part III. the principles of treatment of the more important diseases receive consideration.

Formulæ which the author has found useful in practice will be found at the end of each chapter.

The Appendix contains a selection of formulæ which it is hoped will prove of some value in veterinary pharmacy.

The author is deeply indebted to Mr. Henry Gray, M.R.C.V.S., Kensington, W., for many valuable suggestions, and for writing the section on the Vaccines and Serums for Distemper, Anthrax, Strangles, and Swine Erysipelas, and also the chapter on the treatment of Canine Distemper and Canine Typhus. In this chapter the clinical characters of these two very important diseases receive detailed consideration; this was necessary in order to elucidate their treatment, as hitherto they have received but little attention clinically in British works on veterinary medicine.

The author desires to express his thanks to Sir John McFadyean, Royal Veterinary College, London, for permission to insert the directions for using mallein, tuberculin, and black-quarter vaccine; and also to Lieutenant-Colonel Blenkinsop, D.S.O., A.V.D., for kindly writing the section on the Treatment of Parasitic Mange in the Horse and Ringworm in the Horse.

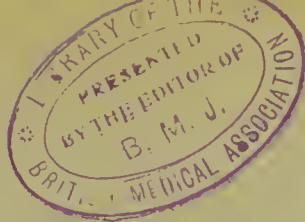
The author gratefully acknowledges the valuable assistance of Professor J. Dundon, M.B., B.Ch., R.U.I., F.R.C.S. Eng., Professor of Materia Medica, Queen's College, Cork, who has kindly read the proof-sheets and suggested many additions and corrections.

In conclusion, the author ventures to hope that the work may prove useful to students and junior practitioners, and that it may assist them in the selection of remedies for the treatment of disease.

E. W. H.

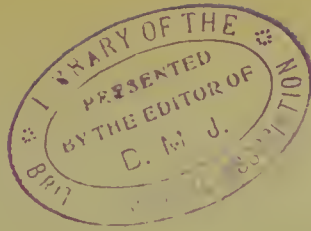
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Veterinarian.
Journal of Comparative Pathology and Therapeutics



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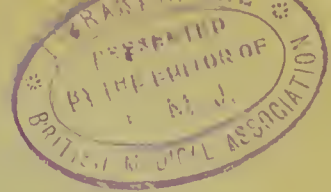
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ERRATA.

- Page 30, line 32, for "embolism" read "thrombosis."
- Page 38, third line from foot, for "salts" read "salt."
- Page 96, line 13, for "**Potassæ caustica**" read "**Potassa caustica**"
- Page 159, line 5, for "Cocaine hydrochloride" read "Cocainæ hydrochloridi."
- Page 159, line 6, for "Glycerine" read "Glycerini."
- Page 178, last line, for "alcoholacts" read "alcohol acts."
- Page 208, line 27, for "carbolic" read "carbolic acid."
- Page 264, line 1, for "not" read "seldom."
- Page 295, line 4, for "respirations" read "respiration."
- Page 311, line 15, for "cases" read "early stages of."
- Page 316, line 27, for "ruit" read "fruit."
- Page 317, line 27, for "carraway" read "caraway."
- Page 354, line 24, for "sialogogue" read "sialagogue."
- Page 367, line 6, for "idiosyncrasies" read "idiosyncrasies."
- Page 369, line 15, after "appreciable" insert "toxic."
- Page 387, last paragraph but one, after "cerebrum" add: "Some authorities state that this effect is due to the absence of vaso-motor nerves in the pulmonary and cerebral vessels."
- Page 390, at end of first paragraph, insert: "With reference to the employment of adrenalin in cases of internal hæmorrhage, similar remarks to those already made in connection with ergot will apply (p. 291)."
- Page 390, last paragraph but one, for "hypodermically" read "intravenously."
- Page 441, line 13, for "Creasote" read "Creosote."
- Page 465, at end of last paragraph but one, insert: "Some cases of acute enteritis may be due to the presence of anthrax."
- Page 483, line 14, for "does" read "doses."
- Page 490, third prescription, for "carophylli" read "caryophylli"
- Page 507, line 27, for "hydrochlorate" read "hydrochloride."
- Page 582, line 20, for "squills" read "squill."
- Where "glycerine" occurs throughout the text read "glycerin."

‘We must first of all put it on record that without the aid of Nature neither precept nor practice will be of much service to us.’

QUINTILIAN : *De Institutione Oratoria*,
Proœmium, 26.

‘A judicious distrust and wise scepticism are the sinews of the understanding.’

EPICARMUS.

‘The knowledge which a man can use is the only real knowledge, the only knowledge which has life and growth in it, and converts itself into practical power. The rest hangs like dust about the brain or dries like raindrops off the stones.’

FROUDE.

VETERINARY THERAPEUTICS AND PHARMACOLOGY

PART I

THE DIAGNOSIS AND GENERAL SYMPTOMS OF DISEASE— THE ACTIONS AND USES OF DRUGS

CHAPTER I

INTRODUCTORY

VETERINARY THERAPEUTICS is the subject which relates to the treatment of disease in the domesticated animals. It embraces not only the application of medicinal agents for this purpose, but also includes such auxiliaries as hygiene, dietetics, the care and management of sick animals, etc.

Therapeutics is termed *Rational* when we are able to give a logical reason for the employment of certain medicinal agents or lines of treatment.

This requires a knowledge of *Pathology*—*i.e.*, the subject which treats of the structural and functional changes caused by disease.

An acquaintance with the actions of drugs on the body is also necessary, this constituting the subject of *Pharmacology*.

Lastly, we must be able to recognise and to appreciate the value of symptoms, in order to ascertain the nature of the affection which we are called upon to treat.

We endeavour to ascertain the *cause* of the symptoms presented, and adopt measures likely to remove or modify this, taking care to assist the efforts of Nature in a similar direction.

Having as far as possible dealt with the cause, we direct our attention to influence the course of the disease in a favourable manner.

In former times our knowledge of therapeutics was founded on the results of experience. Certain medicinal agents were found to produce satisfactory results in a series of cases of the same disease; hence their employment was accepted as the correct form of treatment. Their mode of action in bringing about desired results was not inquired into, or could not be ascertained, and each disease was treated with a remedy that was regarded as specific—*i.e.*, having a selective curative influence on the individual disease. This system of therapeutics is termed *Empirical*, and the value of many medicinal agents was discovered in this manner.

In the present day we endeavour to explain the *modus operandi* of the methods of treatment we adopt. There are still some therapeutical measures which produce beneficial results in certain diseases, although a satisfactory reason for their employment cannot be adduced.

Again, differences of opinion may exist as to the manner in which medicinal agents influence the course of certain diseases, and as to the superiority of one method of treatment over another.

This apparent lack of definite information on the subject can be explained by the fact that our knowledge of pathology is far from complete, while there is yet much to be learned with reference to the precise action of drugs on the various organs of the body.

Therapeutics must be regarded as a progressive science, its advancement depending on experiment and research in the subjects mentioned.

It is not surprising to find differences of opinion existing on many points in connection with the subject of treatment, or to find that we alter our views as we gain more experience and obtain further knowledge of the nature of disease and the action of drugs.

We learn from experience that, while the judicious use of

medicinal agents is attended with beneficial results, their indiscriminate employment is to be condemned. By paying attention to hygienic and dietetic measures we assist the efforts of Nature during the course of a disease, and we are careful when prescribing drugs to recognise the indications for their employment. The heroic forms of treatment which were considered advisable in former times have now been abandoned, as we recognise how futile are our efforts by such means to prevent a disease from running its course.

As an example of the value of rational therapeutics, we may mention the results of the modern treatment of respiratory affections. Instead of endeavouring to act directly on the organs involved, our efforts are directed to the adoption of measures calculated to influence the conditions that are present, in a favourable manner. Pure air, proper sanitary surroundings, a plentiful supply of pure water, food suitable in quality and quantity, proper clothing, and attention to the general comfort of the patient, take first place in the treatment. The indications for febrifuges and stimulants will then be considered, after a careful inquiry into the condition of the pulse, temperature, etc.

In order to study rational therapeutics, and to render the knowledge derived therefrom of practical utility, a clinical acquaintance with disease is necessary. The observation of symptoms, their significance, the art of ascertaining the affection from which the patient is suffering, the selection of suitable remedies, and their influence on the progress of the case, are details that can only be learned by actual attendance on sick animals.

The care and management of cases of disease will also require special attention. The selection of suitable forms of diet, the preparation of the same, and the ways and means of inducing sick animals to feed, are details of such importance that they merit special consideration. We are well aware of the valuable part a careful and trustworthy attendant plays in the treatment and progress of a case, and we know that without such aid the mere prescribing of medicines will not bring about satisfactory results.

CHAPTER II

ON DIAGNOSIS AND THE GENERAL SYMPTOMS OF DISEASE

THE art of diagnosis consists in the observation of symptoms, their correct interpretation, and a recognition of their probable cause, so that by a careful consideration of these factors we can arrive at a conclusion with reference to the disease from which the patient is suffering.

In order to observe symptoms, the student must be familiar with the appearance and habits of animals in a state of health. He must also be acquainted with the normal temperature, the character of the pulse, respirations, heart sounds, visible mucous membranes, skin, excretions, etc. Having gained a thorough knowledge of these by the examination of healthy animals, he will be in a position to appreciate the alterations produced by disease.

A variety of symptoms are met with in the course of practice. Some of these are characteristic of certain diseases, and are termed *diagnostic*; others are common to many affections.

In the study of clinical veterinary medicine the student must learn to observe. No doubt the faculty of observation is far better developed in some individuals than in others, but it can be cultivated in all.

As our patients are incapable of speech, we have to depend on *objective* symptoms—*i.e.*, symptoms which we observe during our examination of the cases. We gain a certain amount of information from the attendant in charge with

reference to the history of the case, but this cannot always be relied on as correct.

In veterinary practice we have to treat different species of animals, each possessing peculiarities of its own, and presenting a variety of diseases for consideration. Again, the action of medicines and the suitable doses vary considerably in horses, cattle, and dogs. A due share of attention to the treatment of diseases and the action of drugs in each species thus becomes necessary.

It must be thoroughly impressed on the student that, in order to recognise symptoms and to arrive at a correct diagnosis, he must study cases of disease in a practical manner. Descriptions of diseases and their symptoms as obtained from text-books or lectures will not be sufficient training; the cases must be seen and carefully observed—in other words, studied *clinically*. As far as possible, the *cause* of each symptom should be inquired into, and in the event of cases terminating fatally a careful post-mortem examination should be made. This not only enables us to prove the correctness or otherwise of our diagnosis, but also aids us in ascertaining the value of the symptoms that were presented, such knowledge often being of great assistance on a future occasion.

It must not be imagined that a correct diagnosis is always possible, or that we can ascribe symptoms to their correct origin in every instance. Obscure cases of disease are frequent, and, considering the difficulties under which we are placed, it is not surprising to find that, in spite of every care, errors in diagnosis and treatment will occur. On some occasions such errors may be discovered during the progress of a case, generally by the appearance of some fresh symptoms, which lead us to suspect the true state of affairs and alter our diagnosis and treatment. On others the error is discovered at the autopsy, and although it cannot be rectified, we gain much valuable information.

In order to guard as much as possible against errors in diagnosis, hasty conclusions should be avoided. A complete examination of the patient must be made, and the symp-

toms present carefully considered before a definite opinion is arrived at or expressed.

There are occasions on which it is not possible to arrive at a definite diagnosis on our first examination of the patient. We refer to the early stages of some affections in which the only symptoms present may be a rise in temperature, loss of appetite, dulness, etc. In such instances we cannot at the time foretell what disease will develop, the symptoms being common to the commencement of several affections.

It is not always an easy matter to ascertain the origin of symptoms. If it were possible to interpret these correctly, and if each disease possessed a regular and constant set of symptoms, diagnosis would be unattended with difficulty. Unfortunately, this is far from being the case, and in some instances, in consequence of reflex nervous action and other causes, symptoms are misleading, and we may be in error as to their origin. For example, intestinal parasites in the dog may cause symptoms resembling those of an affection of the brain, the animal being attacked by a series of convulsive fits. When the parasites are got rid of by suitable remedies, the nervous symptoms disappear. The presence of foreign bodies in the stomach of the dog may produce a staggering gait and the occurrence of fits.

In cattle, derangements of the stomach may produce symptoms attributable to disorder of the brain. In the horse, indigestion or the presence of internal parasites may cause functional disorder of the heart. An attack of pleurisy may be ushered in by symptoms of pain resembling those of spasmodic colic; but in reality the source of the pain is the inflamed pleura, and much discrimination is necessary in order to avoid an erroneous diagnosis.

Many other instances of a similar character might be cited to illustrate the difficulties met with in arriving at a diagnosis. Cases do occur which baffle even the most observant and experienced. In obscure cases it is not wise to defer treatment until we form a diagnosis; the leading symptoms must receive attention. Again, in the early stages

of affections such as influenza, pneumonia, etc., much benefit will accrue from prompt treatment, consisting of rest, suitable clothing, removal to proper surroundings, and, if rigors (shivering fits) be present, the administration of a diffusible stimulant will be indicated.

The owners of animals frequently expect the practitioner to give a prompt diagnosis of a case, and if an opinion is deferred they ascribe the delay to ignorance. We are even expected to give a definite prognosis at times—*i.e.*, whether the patient will recover or succumb to the disease. An amount of tact is required on such occasions, in order to avoid the possible consequences of an erroneous opinion.

A guarded diagnosis is necessary in all cases where the symptoms do not point to the existence of a distinct affection. Opinions given at random sooner or later damage reputation, as gross errors in diagnosis and treatment usually result; these cannot always be concealed, even by the most self-confident practitioner.

A systematic examination should be carried out in all cases which we are called on to treat, and every symptom should be carefully observed. Of course, cases presenting diagnostic symptoms which point clearly to the existence of certain diseases do not need so exhaustive an examination. We purpose to give an outline of the method likely to prove of service in arriving at a diagnosis.

The History of the Case.—Information under this heading has to be obtained from either the owner or the attendant in charge, most frequently from the latter. We ascertain the age of the patient and the length of time he has been ill, and also inquire if he has previously suffered from any disease. We endeavour to obtain a description of the earliest symptoms that were noticed, and inquire if any other animals are suffering from sickness in the same stable. Very often the only information we can glean is that the animal went off his feed, looked dull and sick, and so was kept from work. Or we may learn that a cough is present, or a discharge from the nostrils, or that he has had a shivering fit or an attack of

pain, or that the bowels and kidneys are not acting in a proper manner.

As previously remarked, the evidence we are able to obtain from this source is not always reliable; either the attendant is not sufficiently observant or he is anxious to shield himself from any possible charges of neglect in his care of the animal. Or, as frequently occurs, he thinks he has some knowledge of diseases, and gives an imaginary description of symptoms, his favourite diagnosis being 'something wrong' with the kidneys or a difficulty in passing urine.

By indirect questioning we may be able to elicit some information of importance in those cases where we have a suspicion that such is being withheld from us. We have to inquire as to any treatment that may have been adopted prior to our attendance. A dose of aloes may have been given, and, unless we are aware of the fact, the consequences might be serious. If this drug were given to a case, say, of influenza or pneumonia, the animal's system would become so weakened thereby that a fatal termination might occur, for which we should be unprepared. Or, if it were a case in which a purgative were indicated, we might administer a physic ball, being in ignorance that one had already been given, and superpurgation might result.

In pursuing our inquiry and seeking for information, we shall find it of advantage to adopt a modified form of the Sherlock Holmes' method of investigation. The observance of minor details often leads us to ascertain matters of importance. A look around the stable may show the presence of medicine bottles, etc., and indicate that some treatment has been adopted.

In our own experience, we have frequently found that the exercise of the powers of observation has proved of marked value in this direction. For example, on attending a horse, the symptoms presented were: extensive swelling in the region of the throat, great difficulty in swallowing, fætid odour from the breath, and salivation—evidently a case of septic pharyngitis. No information could be got from the attendant, but on looking around we discovered a sharp-

pointed stick, stained with blood. The attendant, on being questioned, then admitted that he had been trying to administer a physic ball by means of the pointed stick, and suspected that he had injured the throat.

The effects of careless drenching—*i.e.*, the entrance of fluids into the bronchial tubes, causing mechanical bronchitis, frequently come under our notice. This occurrence is usually concealed by the attendant, and is only discovered by auscultation—*i.e.*, examining the chest and listening to the respiratory sounds. We may also observe irritation of the mouth and tongue as the result of the administration of irritating agents not properly diluted. Inquiries should also be directed with reference to the food and method of feeding adopted, to the nature of the work the animal has been engaged in, and whether he has been exposed to bad weather, etc., recently. In female animals inquiries should be made as to the existence of pregnancy.

Having obtained as far as possible the history of the case, we proceed to an examination of the patient. This will include an inquiry into the existence of the general symptoms of disease, such as alterations in the normal character of the pulse, temperature, respiration, visible mucous membranes, the presence of a cough, or of pain, etc.

After ascertaining the temperature of the patient by means of the clinical thermometer, we examine the condition of internal organs by auscultation, and thus obtain a knowledge of alterations in the character of the normal respiratory sounds and heart sounds, or ascertain the absence of intestinal murmurs.

By manipulation we discover the presence of pain on pressure in certain regions, the character of local swellings, and the condition of the abdominal walls. By percussion—*i.e.*, by tapping with the finger-tips on the chest-walls—we ascertain the area of dulness in the thorax depending on consolidation of the lung, or the presence of fluid in this region. If applied to the abdominal wall it informs us of the presence or otherwise of tympanites—*i.e.*, distension of the intestines with gases. By manipulation we also discover

any abnormal conditions in connection with the mouth, tongue, etc., and by a manual examination *per rectum* we are enabled to obtain much valuable information with reference to certain organs situated in the pelvic cavity. An inquiry into the state of the bowels, kidneys, and appetite is also necessary.

Special symptoms must be looked for, such as peculiarities in the gait and the presence of any particular attitudes or postures. In cases where the symptoms point to some form of kidney affection, and in all obscure cases, a chemical and microscopical examination of the urine should be carried out.

We shall proceed in the next chapter to a brief consideration of the general symptoms of disease.

CHAPTER III

ON DIAGNOSIS AND THE GENERAL SYMPTOMS OF DISEASE (*continued*)

Indications furnished by the Temperature.

To ascertain whether any elevation of temperature is present in the patient is one of the most important steps in connection with the diagnosis of a case. The evidence obtained by the use of the clinical thermometer is of marked value, not only as an indication of the gravity of the case, but also of its progress while under treatment. Even in the absence of other symptoms, the presence of elevation of temperature enables us to place the patient under proper treatment, and to await further developments.

Elevation of temperature is popularly known as 'fever,' but in reality this term includes many concomitant phenomena, of which the abnormal temperature is but a manifestation. Many affections are preceded and accompanied by a rise in temperature, the degree of which varies according to the nature of the disease and its severity. It is a serious symptom when occurring during the course of an abdominal affection, especially when associated with alterations in the character of the pulse.

After extensive surgical operations, and in cases of severe wounds, the condition of the temperature is an important indication as to the progress of the patient. If the temperature runs high in such cases, and is accompanied by symptoms of constitutional disturbance, we may have the serious condition known as *irritative* fever to deal with—such as may

occur in cases of open joints and deep punctured wounds of the feet in horses. Fever may also depend on the presence of toxins, or of septic material in the system.

The temperature is registered by placing a clinical thermometer in the rectum, and keeping it in this region from half a minute to three minutes, according to the registering power of the instrument. Care should be taken that the bulb of the thermometer comes into contact with the mucous membrane of the intestine, otherwise the correct reading will not be taken.

The average normal temperature of the horse is 100.4° F., the ox 102° F., the sheep 103° F., the pig 102° F., and the dog 101° F. These vary to a slight degree under certain circumstances, being raised by exercise and during very hot weather, etc.

Indications furnished by Alterations in the Character of the Pulse.

The pulse is the wave set in motion by the propulsion of blood by the heart into the arteries. It is thus an index of the condition of the heart, and hence its consideration is of great importance with reference to diagnosis, the general condition of the patient, and the question of suitable treatment.

The character of the normal pulse should be carefully studied. In the horse the submaxillary artery is the most convenient for taking the pulse. Observe that the beats are regular and from forty to forty-five per minute, the artery showing a healthy firmness to the touch. In cattle the number of beats of the pulse cannot be regarded as a reliable guide, as in many instances even approaching the animals will be sufficient to cause a large increase in the number of pulsations, the act of rumination having a similar effect.

The normal pulse of the cow is about forty to fifty per minute, and may be taken at the posterior part of the fore-fetlock or in the tail. The pulse of the dog varies, according to the size and breed of the animal, from eighty to one hundred per minute. It is best taken at the femoral artery, and, in

judging of its character, it is essential that the animal be quietly handled and not excited in any way.

In drawing conclusions from our examination of the pulse, we must be careful to ascertain the cause of any alterations in its character, and not fall into the error of ascribing every instance of irregularity or intermittency in the pulse-beats to a cardiac affection. Digestive derangements, nervous disorders, anæmia, etc., may cause what would appear to a casual observer to be a serious alteration in the character of the pulse, and lead him to give an erroneous opinion.

A physical examination of the heart should never be omitted in seeking for the cause of an abnormal condition of the pulse. Varieties of the pulse are met with which are of importance with reference to diagnosis and treatment.

The Frequent Pulse.—In this condition the number of beats per minute is increased above the normal. In nervous animals a frequent pulse may be coexistent with perfect health. Repletion of the digestive organs, exercise, or excitement, causes a temporary frequency of the pulse. In the primary stages of fevers and in inflammations of visceral organs a frequent pulse is usual.

The Infrequent Pulse is the opposite condition to that just mentioned. It is often associated with the character of slowness, and is met with in cases of brain disorders, and also in diseases characterized by alterations in the blood.

The Quick Pulse.—In this variety each beat occupies less than the usual time, although the number of pulsations per minute may not be increased. It depends on the mode of contraction of the ventricles, and is met with in cases characterized by excessive nervous irritability, and in some forms of cardiac disease.

The Slow Pulse is the reverse of the above variety. It indicates a prolonged or slow contraction of the ventricles.

The Large Pulse is characterised by a fulness in volume, and may occur either with strength or feebleness of the pulsation.

In cases of severe congestion of the lungs we have the artery full in volume, but the pulsations weak. This has been termed the 'oppressed pulse.'

The Small Pulse.—In this form the volume is smaller than normal. It may arise from feeble action of the heart or from anæmia.

The Hard Pulse.—Contraction of the muscular coat of the arterial walls causes this condition of pulse. It is incompressible to the touch, and when associated with the character of smallness it is termed 'wiry' or 'thready.' In inflammation of serous membranes, such as pleurisy, peritonitis, meningitis, etc., we find the pulse in the primary stages small and hard. The hard pulse may be associated with the character of largeness, as in cases of acute laminitis, in which the pulse may be described as quick, full, and bounding.

The Soft Pulse may be associated with the condition of slowness, and as such, it occurs towards the termination of slow exhausting diseases; the impulse of the heart is weak, and the amount of blood propelled at each ventricular systole is deficient.

Strength and Weakness of Pulse.—We must distinguish between *strength* of pulse and a *full but feeble* pulse. The latter is generally associated with slow action of the heart and relaxation of the arterial coats.

Intermittent Pulse.—In this variety a beat may be missed, either at regular periods or occasionally. This condition may be compatible with perfect health, and is often met with in the dog; or it may arise from dyspepsia or nervous affections.

The Irregular Pulse.—This must be carefully distinguished from the variety just mentioned. The beats differ in length, force, and character, and thus are termed 'irregular.' This condition usually depends on the presence of cardiac disease.

The varieties of pulse mentioned must be regarded as symptoms; in some cases, however, they may offer important indications for treatment. Thus, the quick, full pulse met with in acute laminitis indicates the employment of sedatives and febrifuges, such as the judicious administration of tincture of aconite and nitrate of potassium. The frequent

small compressible pulse indicates the use of alcoholic stimulants.

During the course of abdominal affections the pulse is an important guide. Thus, in ordinary spasmodic colic, although the pulse may be increased in frequency during the paroxysms of pain, it returns to the normal in the intervals. In cases of enteritis or other fatal lesions, the pulse becomes altered from the commencement of the attack, and assumes what is known as a 'running-down' character.

A gradually imperceptible thready pulse is always a sign of a fatal termination, and is met with in the later stages of a variety of diseases.

A venous pulse may be observed in the jugular veins of the healthy ox. In the horse, an apparent jugular pulse is observed when the animal's head or neck is extended; but in reality this depends on the beats of the carotid artery, which are rendered visible by the parts becoming tense and pressed together. A true jugular pulse may be a symptom of cardiac disease, and it is also met with in pulmonary congestion.

Symptoms connected with Alterations in the Condition of the Visible Mucous Membranes.

We examine the Schneiderian mucous membrane and also the conjunctiva. In a normal condition these are of a pale red or carnation colour, but severe exercise or excitement causes increased vascularity and redness.

Acute inflammatory affections, such as enteritis, are accompanied by a deep congestion and marked redness of these visible mucous membranes, which in the later stages become of a dark-red colour.

In cases of respiratory affections, when imperfect aëration of the blood is present, either from interference with inspiration—*e.g.*, acute laryngitis, acute bronchitis—or from diminished area for respiration—*e.g.*, pneumonia—the visible mucous membranes assume a dark, dusky, or a violet hue.

Yellowness of the Visible Mucous Membranes may indicate some affection of the liver, or jaundice of obscure origin.

The Presence of Petechial Spots points to a depraved

condition of the blood, such as exists in that disease termed 'purpura hæmorrhagica.'

A pallid condition of the visible mucous membranes is found in anæmic cases and in cardiac affections. In cases of internal hæmorrhage pallidity appears suddenly.

A slate-coloured appearance of the Schneiderian mucous membrane may be observed in cases of glanders, and this membrane is one of the seats of the characteristic ulcers of this disease.

The buccal mucous membrane and the tongue should next be examined.

In febrile and inflammatory affections there is a dry condition of the mouth and tongue. In cases of indigestion, a sour soapy condition of this region may be present; while in the dog a distinctly furred tongue is a symptom of disorders of the digestive organs. An inflamed condition of the buccal mucous membrane, with increased secretion of saliva, may be due to the administration of irritating medicaments not properly diluted, while salivation may depend on various causes (see Part III.).

Symptoms in Connection with the Respiratory Functions.

Under normal conditions the ratio of the respirations to the pulse is usually one respiration to three or four pulsations, and this is maintained during exercise or exertion. In the bovine species this relation does not exist to the same extent—as, for example, during rumination the pulse may rise to seventy or eighty per minute, while the respirations may be about ten.

Accelerated Respirations and Dyspnœa or Difficult Breathing.—Exercise or exertion cause quickened respirations, which return to the normal during quiescence.

Accelerated respirations vary in degree, and, when assuming the character of difficult or laboured, they constitute what is known as *dyspnœa*. Such symptoms are not always diagnostic of respiratory affections; thus, they are present in acute inflammatory conditions of other organs, in laminitis, irritative fever, etc. An examination of the chest.

together with a consideration of other symptoms present, will enable us to account for the altered character of the respirations.

In respiratory affections difficult breathing may depend on :

1. Obstruction to the entrance of air to the lungs, such as occurs in acute laryngitis and acute bronchitis.
2. Lessened area for respiration in the lung itself, as in pneumonia.
3. Interference with the expansion of the lungs, caused by the presence of fluid in the cavity of the chest.
4. The presence of pleurisy—*i.e.*, inflammation of the pleura, which renders the respiratory act painful.
5. Engorgement of the lung with venous blood, such as occurs in cases of pulmonary congestion.

There are certain types of respiration met with which are of importance as aids to diagnosis.

1. *Abdominal Breathing*.—In this condition the movements of the thoracic walls are limited as much as possible, the ribs are fixed to a certain extent, and there is the appearance of a hollow line extending along the lower borders of the false ribs, from the sternum to the anterior spine of the ilium. The abdominal muscles then act as auxiliaries, and make up for the limited action of the special muscles of respiration. The respirations are quick and incomplete. This type of breathing is found in cases of pleurisy, also in hydrothorax.

2. *Thoracic Breathing* is characterised by the abdominal muscles being as far as possible in a state of quiescence, while extra movements of the thoracic walls make up for the deficiency. This condition occurs in cases of peritonitis, flatulent colic, ascites, etc.

3. *Irregular Breathing*.—In this form the inspiratory movement is performed rapidly, while the expiratory movement is accompanied by a spasmodic double action, especially of the abdominal muscles. It is characteristic of that affection in horses termed 'broken wind' (Part III.).

4. *Stertorous Breathing*, in which a snoring sound is made during respiration, is met with in some cases of brain disease,

and is a serious symptom. It depends on a relaxed or paralysed condition of the soft palate.

A loud roaring sound accompanying inspiration especially is found in some cases of that disease known as 'strangles.' It may depend on spasm of the muscles that close the glottis, or on an œdematous condition of the latter. It is also met with in some cases of acute laryngitis.

Cough as a Symptom of Disease.

A cough may be a symptom of a respiratory affection, in which case it usually depends on some irritation of the larynx, bronchial tubes, etc.; or it may be reflex, and as such is found in cases of indigestion, internal parasites, etc. There are varieties of coughs, with which it is necessary the student should be acquainted :

The Dry Cough is present during the first stages of catarrhal affections. In cases of pleurisy the dry cough is short and painful, the forced expiratory movement causing pain.

The Moist Cough is met with in the secondary stages of catarrhal affections, and indicates the presence of an increased secretion of mucus, etc.

The Chronic Cough, as its name indicates, continues indefinitely, and resists treatment.

In the disease known as 'broken wind' the cough is short, shallow, dry, suppressed, and usually single; at times, however, a paroxysm of coughing may occur.

In cases of *roaring* the cough is deep and hollow.

In young horses a loud paroxysmal cough may occur from the irritation of teething, usually appearing between the fourth and fifth years.

In the dog a dry hacking cough is present in cases of pharyngitis. An examination of the throat reveals the cause of the symptom.

Among other symptoms in connection with the respiratory function we may mention the presence of *fœtid breath*, also a discharge from the nostrils.

A Fœtid Condition of the Breath may arise from gan-

grene or abscesses in the lungs, or from a diseased molar tooth, or from disease of the facial sinuses. We may also observe a similar symptom in cases of septic pharyngitis. Fœtid breath in the dog may depend on indigestion or disorder of the liver.

A discharge from the nostrils is a symptom of importance. The nature of the discharge varies. It may be mucus, pus, or muco-purulent in character in respiratory affections, and in some cases of pneumonia a rusty-coloured discharge is present. In purpura hæmorrhagica it may be thin and streaked with blood. In cases of nasal gleet arising from diseased bones or teeth the discharge is purulent and very fœtid. In glanders the nasal discharge is starchy and glue-like in appearance, and tends to adhere to the nostrils. In canine distemper a nasal discharge is often a prominent symptom.

Symptoms furnished by the Surface of the Body and Extremities.

In the normal condition there is an equable temperature of the surface of the body and the extremities. In acute inflammatory diseases the temperature may be irregularly distributed, the extremities and ears becoming excessively cold. The presence of *cold sweats* over the body is a symptom met with in cases approaching a fatal termination.

Rigors, or shivering fits, occur at the commencement of many affections, and are often the first symptoms to be observed. Influenza, pneumonia, enteritis, lymphangitis, and peritonitis, may be ushered in with this symptom, accompanied by a staring coat and coldness of the extremities.

The skin in a state of health presents a smooth and glossy appearance. In cases of indigestion, hepatic disorder, and also from the presence of parasites in the alimentary canal, a dry, inelastic, scurfy condition of the skin is present, to which the term 'hide-bound' is applied. A similar condition is found in connection with chronic wasting diseases—*e.g.*, tuberculosis.

In that affection known as urticaria, nettle-rash, or surfeit, there is a sudden eruption of roundish or oblong eminences on the skin over various parts of the body. This usually disappears in a short period of time. The skin may be affected by various diseases, some of a parasitic nature, others depending on constitutional causes.

Profuse Sweating occurs in a variety of diseases in the horse. It is present in the first stages of that disease known as azoturia, also in cases accompanied by acute pain, and in the later stages of meningitis, tetanus, etc.

Thirst is a symptom met with in different affections. Thus it is present in diabetes insipidus in the horse, and in that condition known as 'broken wind,' in which there is a tendency to gastric derangement. It is also present in febrile cases and in cases of indigestion, and in affections of the liver. In the dog excessive thirst occurs in gastritis, large quantities of water being taken, which are, however, quickly vomited by the animal. In cattle and sheep suffering from parasitic gastritis, constant thirst is a prominent symptom.

Loss of Appetite is the commonest symptom met with in sick animals, and is usually the first sign of illness that is observed by the attendant. It is a symptom of great importance, not only as an indication of the existence of disorder or disease, but also during the course of an affection its presence adds considerably to the gravity of the case, and suggests careful nursing in order to overcome it. An abnormal appetite may be an indication of the presence of parasites in the alimentary canal; it also accompanies that affection known as 'broken wind' in the horse. A craving for alkalies, evidenced by the eating of clay and licking the walls of the stall, suggests gastric indigestion and excessive acidity; while a tendency to eat dirt, etc., is an indication of a similar condition.

Symptoms furnished by the Excretions.

The fæces may be abnormally soft in consistency or even fluid; this occurs in diarrhœa. Some horses of a nervous, excitable temperament have a tendency to purge at the

commencement of their work. Indigestion may produce a similar effect, as when the ingesta pass too rapidly from the stomach to the intestines.

Oats and hay, when new, cause diarrhœa in some horses, while during dentition purgation may be easily induced by changes in diet. The presence of undigested oats in the fæces is an indication that mastication is not carried on properly, and suggests attention to the molar teeth. A dry, hard condition of the fæces may depend on too dry food or impaired intestinal action.

A pale colour, accompanied with much fœtor, is generally due to disorder of the liver. In cases of dysentery the fæces are fluid, contain flakes of lymph, are blood-stained, and excessively fœtid. Non-passage of fæces may depend on intestinal paralysis, or on mechanical obstruction, or on inflammatory conditions such as enteritis or peritonitis.

Finally, we may remark that the existence of intestinal parasites can often be detected by their presence in the fæces.

The Urine may be abnormal as regards quantity, colour, density, and composition. Micturition may be modified as regards frequency, the amount of urine passed, or there may be suppression of urine or difficulty in urination.

An excessive discharge of very pale-coloured urine of low specific gravity, accompanied by excessive thirst, is a symptom of that affection known as 'diabetes insipidus.' Urine of a dark-red or porter colour is a symptom of that disease termed 'azoturia.'

A scanty secretion of urine of high specific gravity, and containing albumin, epithelium, casts of the uriniferous tubes, blood-corpuscles, etc., is found in cases of acute nephritis. In some cases of chronic nephritis there may be an excessive flow of pale-coloured urine of low specific gravity.

The presence of sugar in the urine—very rare in horses, but met with in dogs—indicates the existence of that disease termed 'diabetes mellitus.' The presence of albumin in the urine may depend on the existence of disease of the kidneys when it is persistent, but if temporary it may be due to

cerebro-spinal irritation, or to the application of large cantharides blisters, which by absorption of cantharidine irritate the kidneys.

In jaundice the urine is of a deep-yellow colour, and contains bile pigments.

A chemical and microscopical examination of the urine is of the greatest importance in the diagnosis of all these conditions.

A red or black colour of the urine is found in that disease termed 'red water' in cattle. The presence of blood diffused in the urine may be due to a renal calculus. When depending on hæmorrhage in the bladder, the blood is discharged at the termination of the act of micturition, and in cases of urethral calculi at the commencement of the act as well.

Suppression of Urine may occur in cases of acute nephritis.

Inability to Pass Urine—termed 'retention'—may depend on a paralysed state of the bladder, due to over-distension, or to affections of the brain or spinal cord; also on spasm of the neck of the bladder occurring as a complication of colic, on the presence of a calculus in the bladder or urethra, or from an accumulation of smegma in the sheath.

Incontinence of Urine—*i.e.*, a continual flow—may depend on a paralysed condition of the sphincter of the bladder, or in the female from injuries to the urethra sustained during difficult parturition, or from the presence of a calculus or of sabulous matter in the bladder.

On Symptoms in Connection with the General Appearance of the Animal.

The general appearance of an animal in health—*viz.*, a bright eye, glossy skin, good condition, erect ears, attention on the entrance of anyone to the stable, regular breathing, an easy attitude, etc.—are points which are familiar to those accustomed to horses.

Some horses are naturally dull-looking in their appearance, and others fail to put on condition, without any indications of ill-health. Alterations in the expression of the countenance are readily recognised. Thus we have a haggard look and sunken eye towards the end of acute intestinal affections; a worn-out and distressed expression in the later stages of fatal respiratory affections; a gloomy and anxious countenance, with cold sweats over the body, in cases of rupture of the stomach. Any alterations from the normal appearances are apparent to one who has trained his faculty of observation.

The recognition of what might appear to be a trivial symptom may prove of great importance. For example, closure of the eyelids, with swelling and redness of the conjunctiva, may be the first symptom presented in that form of influenza known as pink-eye. By taking the temperature, and finding it elevated, we are enabled to isolate the patient and prevent the spread of the disease, and also to adopt early treatment.

By observing the general appearance of the patient we are enabled to detect signs of improvement during the progress of a case, or the opposite condition, or we may discover symptoms which are significant of the occurrence of a complication. For example, sudden swellings of the limbs, nostrils, and lips may be the first indication of purpura hæmorrhagica occurring during the course of a respiratory affection.

On the Presence of Pain as a Symptom.

Pain varies in degree, depending on its origin and to a certain extent on the temperament of the animal.

Acute pain is manifested in a variety of ways. It may be spasmodic—*i.e.*, occurring in paroxysms, such as in spasmodic colic—or it may be continuous, as in enteritis or volvulus.

In gastritis, pain may be evidenced by restlessness, pawing, moving about the stall, occasional rolling, quickened respiration, and an anxious expression of countenance.

In spasmodic colic the animal expresses pain by lying down, rolling, rising up quickly, turning the head towards the flanks, and there are intervals of ease between the paroxysms; this is termed intermittent pain. Pain of a similar character may be present in the early stages of pleurisy and in nephritis.

Continuous pain—*i.e.*, with no intervals of ease—is present in cases of enteritis and in fatal lesions such as volvulus. This is evidenced by constant change of position, rolling, accelerated respiration, frequent groaning, sweating, and a haggard and anxious countenance.

Acute pain in cases of laminitis, erysipelas, open joint, etc., is manifested by greatly accelerated respiration, occasional groaning, disinclination to move, excitement, and sweating.

In cases of intestinal obstruction depending on a paralysed condition of the colon and retention of the ingesta, the pain is dull in character, but may become acute at intervals. Dull pain is evidenced by pawing, uneasiness, walking round the stall, occasional rolling, lying down and rising at intervals, etc.

Violent pain is manifested by the animal throwing himself about in all directions, rolling from side to side, and assuming a variety of postures in order to seek relief. This is present in cases of twist of the intestine and in strangulated hernia.

In cattle, acute pain is not manifested to the same degree as in the horse. A frequent grunt or moan is a symptom of pain in many affections, and in acute inflammatory diseases of the stomach brain symptoms are apt to develop, evidenced by excitement, delirium, etc.

In the dog, pain is manifested by uneasiness, constant change of position, whining, or, if severe, by fits of yelping. In muscular rheumatism, and in spinal meningitis, spasmodic fits of loud, sharp cries are not uncommon, especially if the animal be lightly handled or forced to alter his position.

Symptoms afforded by the Attitude and Movements of the Patient.

Extension or Protrusion of the Head, popularly known as 'poking out the head,' may be a symptom of acute laryngitis, pharyngitis, strangles, tetanus, rheumatism affecting the cervical muscles, or injury to the joint between the axis and the atlas.

Drooping of the Head, with hanging of the Ears, occurs in cases of extreme debility, also in mechanical injuries to the levator muscles and in some cases of rheumatism.

Cattle and dogs suffering from acute chest affections may assume the recumbent position, as they can lie on the sternum without inducing respiratory distress.

In respiratory affections in the horse continuous standing is usual. This position causes less interference with breathing, as the horse in a normal condition lies to a large extent on the ribs.

Turning of the Head towards the Flank is an indication of abdominal pain, depending on various causes. Forcing the head against solid objects is a symptom met with in that disease known as 'stomach staggers'; it also occurs in the earlier stages of meningitis.

In cattle suffering from derangements of the stomach the head may be carried in various directions and forced against surrounding objects.

In cases of chronic meningitis in the dog the head is carried sideways, causing a peculiar appearance. Marked stiffness of the neck, accompanied by sharp yells if the animal is touched, is indicative of meningitis affecting the cervical region of the spinal cord.

Sudden depression of the head, the nose being drawn down to the sternum, is the posture characteristic of the act of vomiting in the horse. This may occur in cases of ruptured stomach, and occasionally during the course of certain gastric affections.

Shaking of the head, twisting it sideways, looking upwards,

and champing of the jaws, are symptoms observed at the commencement of an attack of megrims in the horse.

The posture of standing with the elbows turned outwards and the toes directed inwards is seen in cases of pneumonia, when the respirations become greatly accelerated. When marked prostration supervenes the opposite position is assumed.

A cramped position of the body, with the hind-limbs drawn under the abdomen and the fore-feet advanced, and attempts to throw the body-weight temporarily on the heels, is indicative of acute laminitis of both fore-feet.

A marked stiffness of the whole body, irregular clonic spasms of the muscles of the tail, convulsive retraction of the eyeballs, protrusion of the membrana nictitans and of the nose, are suggestive of tetanus.

Rolling on the back, and assuming this position for a few minutes, with the feet against the sides of the stall, may be a symptom of twist of the intestine, but also occurs in some cases of very acute spasmodic colic.

Sitting on the Haunches, which is a normal position in the dog, is a very serious symptom in the horse. It is not always to be regarded as a fatal one, as it occurs in acute gastric tympany; but it may be present occasionally in cases of rupture of the stomach or intestine, and in cases of intestinal calculus.

Lying on the sternum with both fore-legs extended is an occasional symptom in cases of gastritis in the horse.

Resting on the sternum with the hind-quarters elevated is occasionally seen in cases of gastritis in the dog.

Inability to Rise is a symptom of many and varied affections. It may depend on fracture of the vertebræ, injury to the spinal cord, meningitis, azoturia, the later stages of nephritis, certain pelvic fractures, strain of the *psoæ* muscles, etc.

In the dog, sudden paralysis may affect both hind-limbs, resulting from that affection known as 'pachymeningitis' (Part III.), while in the later stages of gastritis, paralysis of the hind extremities may also be observed.

In cattle, inability to rise may occur during the course of gastric affections, cerebral symptoms usually being present as well.

In milk fever the cow lies either with the head turned towards the shoulder or neck, or lies on the side with the head stretched out.

Convulsive struggling with fore and hind limbs, with inability to rise, occurs in cases of meningitis, in the later stages of azoturia, and of nephritis.

Forcing of the head and neck in a backward direction while the animal is lying down is a symptom observed in some cases of gastritis, also in meningitis, and in the later stages of renal affections and of azoturia. A staggering gait occurs in the early stages of stomach staggers, meningitis, diseases of the spine, etc.

Partial loss of control over the hind extremities is present in the early stages of azoturia, also in strain of the psoæ muscles.

A weakness in movement of the hind extremities may occur in cases of influenza.

Partial Loss of Control over the Hind Extremities has been observed as a symptom of the presence of foreign bodies in the stomach of the dog. Spinal affections in this animal may present a similar weakness in movement.

A disinclination to alter his position, with pain on movement and stiffness, accompanied by a grunt, especially if the region of the chest be handled, are indications of the early stages of pleurisy in the horse.

Continually stretching out as if to urinate, a quivering tail and continuous pain, are symptoms present in cases of obstruction of the single colon in the horse, and suggest a rectal examination to confirm the diagnosis.

Frequent attempts at micturition and the passage of small amounts of urine suggest acute nephritis. This symptom in the absence of the passage of urine is an indication for the employment of the catheter, and suggests an examination of the state of the bladder by a rectal exploration, also

an examination of the prepuce for collections of smegma therein.

A frequent desire to urinate, accompanied by stiffness of both hind-limbs and repeated movements of the tail, but no passage of urine, may indicate the presence of a vesical calculus; or a sudden cessation of the flow of urine, followed by pain and distress, suggests a similar condition, the diagnosis, of course, being confirmed by an examination of the bladder *per rectum*.

A Swollen Condition of the limbs may occur in a variety of affections. This symptom may result from want of exercise, and is also met with in debilitated states of the system, and in renal and cardiac affections.

In cases of purpura hæmorrhagica the swelling of the limbs is characteristic. It ceases abruptly, as if a string had been tied above the affected part.

The occurrence of **dropsical swellings** in the region of the sternum and abdomen may, if slight, depend on debility of the system; if more marked, they may be an indication of cardiac or renal disease, or of hydrothorax.

The presence of **ascites** may be due to cardiac, hepatic, or renal disease, or to morbid conditions of the peritoneum.

In cattle a dropsical swelling in the region of the dewlap, accompanied by recurring attacks of indigestion and tympanites of the rumen, suggests an examination of the heart, the above symptoms being present in cases of traumatic pericarditis. This condition results from the presence of a foreign body in the pericardium, which has found its way thereto from the second division of the stomach, being usually a sharp article that has been swallowed by the animal.

On Tympanites as a Symptom of Disease.

Tympanites—*i.e.*, the presence of an abnormal amount of gas in the intestines, evidenced by a tense, drum-like condition of the abdominal walls—occurs in cases of flatulent colic, and also to a varying degree in other abdominal

affections in which a paralysed state of the intestines is present. Thus we find it in cases of impaction of the colon, the later stages of enteritis and peritonitis, and in fatal abdominal lesions, such as volvulus.

In cattle, tympanites of the rumen occurs under a variety of conditions; in fact, anything which tends to interfere with rumination may cause the formation of gases in the rumen, with the familiar tense enlargement of the left flank. In cases of milk fever, when the animal is allowed to lie on her side, marked tympanites is frequently met with.

In the horse a hard, non-resistant condition of the abdominal muscles, painful on pressure, is met with in cases of enteritis, peritonitis, rupture of the stomach or intestine, etc.

Abdominal distension in the dog occurs in cases of peritonitis, intestinal obstruction, etc. We must be careful, however, in forming a diagnosis in cases of this kind. Thus a greatly distended bladder may be the cause of the distension; or that disease known as pachymeningitis causes a similar symptom, but in the latter there is most acute pain when the animal is handled.

In young puppies the presence of large numbers of parasites in the intestines (the *Ascaris marginata*) causes obstruction with great abdominal distension, accompanied by continuous sharp yells of pain.

The occurrence of tympanites during the clinical course of a case must be regarded as a very unfavourable symptom.

On the Evidences afforded by Rectal Exploration.

An examination *per rectum* often gives valuable information with reference to the state of the organs within the pelvic cavity, and also it indicates the presence of any abnormalities in connection with the bloodvessels and bones in this region.

Violent straining occurring on the introduction of the hand and arm into the rectum is met with in cases of acute intestinal obstruction, depending on the presence of volvulus, etc. This may also occur in cases of simple impaction of the colon, but more frequently in this condition we find the

rectum dilated, with passive walls (a condition which has been termed 'ballooned').

By a rectal examination we can locate and ascertain the condition of many of the pelvic organs. On the right side the cæcum and large colon can be felt. On the left and towards the centre the pelvic flexure of the colon can be located. Manual examination will enable us to ascertain the condition of these viscera.

An impacted colon with paralysed walls can be readily recognised; so also can a tympanitic condition of the same viscus be detected. Impaction of the single colon may be discovered, and the presence of an intestinal calculus, if within reach, may be ascertained.

But there are occasions in which we find portions of intestine displaced, and are unable to satisfy ourselves as to the exact state of affairs. Such usually occur in obscure if not fatal cases. Some practitioners profess to be able to diagnose displacements of the double colon, and even to remedy such, by manipulation *per rectum*. We have never been able to attain either this skill in diagnosis or dexterity in manipulation. The condition of the bladder can be examined *per rectum*. It may be found either distended with urine or empty, or it may be very sensitive to manipulation. The presence of a vesical calculus can also be detected.

Rectal examination is most important in the diagnosis of strangulated hernia, the presence of the intestine in the inguinal canal being readily detected. In all cases of abdominal pain occurring in stallions this mode of examination should never be omitted.

A fluctuating swelling at the side of the pelvis may indicate the presence of a calculus in the ureter.

The presence of embolism of the iliac arteries is ascertained by examining these vessels *per rectum*, and observing if the normal pulsations are absent.

In the diagnosis of pelvic fractures, examination *per rectum* often enables us to locate the seat of the injury; also in the diagnosis of strain of the psoæ muscles the presence of swelling and tenderness can be detected.

The left kidney can be felt in some horses, especially if the practitioner has the advantage of possessing a long arm. We cannot say, however, that examination of the kidney by this means has proved of any value in diagnosis.

Abdominal tumours may sometimes be detected by rectal examination, also the presence of an intra-abdominal scirrhus cord; this is occasionally an unfortunate sequel to castration.

In foals a digital examination of the rectum enables us to detect the presence of retained meconium and to adopt suitable treatment.

In the dog rectal examination proves of marked value in diagnosis. An enema should first be administered to the animal in order to remove the fæces; the finger, well oiled, should be carefully inserted, and an examination of the rectum carried out.

The presence of sharp bones causes acute pain and straining. These can be detected and removed. A distended bladder may be revealed, necessitating the use of the catheter. A bladder paralysed from over-distension with urine may occur in the dog, without any symptoms pointing to such a state of affairs beyond a fulness of the abdominal region.

A discharge of blood, mucus, etc., from the rectum, with or without straining in defæcation, should be sufficient to indicate a digital examination. Such symptoms may be due to the presence of ulcers, hæmorrhoids, or to cancer of the rectum. Neglect of this mode of examination has frequently led to an erroneous opinion being given.

Enlargement of the prostate gland, which is occasionally met with in the dog and gives rise to difficulty in urination, can be detected by rectal examination.

CHAPTER IV

THE CARE AND MANAGEMENT OF SICK ANIMALS

(a) The Horse.

THE diagnosis of disease and the prescribing of medicines are but a part of the practitioner's duties in connection with the subject of treatment. Attention to the surroundings of his patient, and to clothing, diet, nursing, etc., is of vital importance with reference to successful results. The greater clinical experience we possess, the more importance we attach to details of the above nature, and, we may add, the less drugs we employ.

It is very easy to lay down an ideal standard for the hygienic and dietetic management of sick animals, but it is difficult to carry this into practice. The comfortable, airy loose-box, as described in the lecture-room, is not always to be obtained; while an attendant who is able and willing to carry out instructions faithfully and to take an interest in the patient is seldom met with, especially in country practice. And, not only have we to contend with ignorance in the management of our patients, but also we have to overcome prejudices existent in the minds of owners and attendants of animals. The most striking of these prejudices occurs with reference to hygienic surroundings and careful nursing. These are regarded as of minor importance, while there is a universal desire for the continual administration of drugs.

The Surroundings of the Patient.—As regards the surroundings of the patient, it is exceptional to obtain a properly ventilated and thoroughly drained stable. Either the atmo-

sphere is hot and reeking with the odour of urine, or the building is cold and draughty. Being compelled to make the best of the surroundings, we have to exercise our ingenuity in order to secure a supply of pure air for the patient and to maintain a proper temperature of the building. It is impossible to lay down rules on this subject, as tact and common-sense will indicate to the practitioner how to obtain sufficient ventilation without the occurrence of draughts. Much will depend on the construction of the stable, and the willingness of the owner to carry out our suggestions. Frequently we are forced to treat cases under the most adverse circumstances as regards ventilation and drainage.

It is particularly unfortunate that drainage of stables is usually so neglected. Either no drains are in existence, or, worse still, they are badly constructed and become choked, no attention being paid to them by the attendant. Here, again, we have to adopt the best means at our disposal under the circumstances, and by a thorough cleansing, and the liberal use of disinfectants, we endeavour to purify the surroundings. A common error is to apply disinfectants to a filthy floor, instead of first thoroughly cleaning the latter.

It is in the treatment of respiratory affections and of wounds that the importance of sanitary surroundings becomes most evident. We know only too well the baneful influences that impure air and dirty floors exert on these conditions, and how impossible it is to expect satisfactory results from our treatment under such circumstances. The frequency of such serious sequelæ to pneumonia as purpura hæmorrhagica, gangrene of the lung, etc., in badly-kept, ill-ventilated stables, as compared with the results of treatment under more favourable surroundings, is sufficient evidence to justify us in adopting every possible means to secure attention to hygienic surroundings. A clean, dry straw bed is an important essential for the sick animal, the straw being properly laid so as not to hamper his movements. If possible, the stall should be isolated so as to secure, not only quietness, but also as much pure air as can be obtained.

Clothing.—Discrimination is necessary in order to prevent

discomfort by too much clothing. The use of clothing is to keep the surface of the body warm and to assist cutaneous circulation. Coldness of the surface of the body and the presence of shivering fits are indications for the employment of extra rugs, and also for the application of woollen bandages to the legs. An excessive amount of clothing causes distress, sweating, and fatigue, which weakens the animal. In cases of high fever, clothing of the lightest character should be employed. Care should be taken that the clothing used is dry, also that the surcingle is not fastened too tight, and that the bandages are properly applied and removed twice daily.

In country practice suitable rugs are seldom to be obtained, and we have to make use of whatever material is at hand. Twisted hay has to take the place of woollen bandages, while blankets or quilts from the farmer's bed may have to be requisitioned. During convalescence the extra clothing should be *gradually* removed, so as to avoid any danger of a chill.

Diet.—The feeding of sick animals is of the greatest importance. During the course of a case, if the animal has a fair appetite, we know that he is progressing favourably; but if all food is refused, we have great difficulties to contend with. The baneful practice of forcing food on the animal by means of drenching with gruel, so prevalent among many attendants of horses, cannot be too highly condemned. Not only does this annoy and distress the patient, but it also causes derangement of the stomach, and still further increases the distaste for food. Besides, there is the great danger of careless drenching, by which the fluids administered may gain access to the bronchial tubes and set up mechanical bronchitis.

When attending a case, we are frequently told that the animal will not eat anything. A little observation, however, will supply a reason for this; we shall probably find a quantity of sour food left before the patient, and the manger and feeding utensils in a dirty condition. No trouble is taken in the preparation of the food, and the idea of varying

the diet, or coaxing the animal to feed, is never entertained. The sick horse is most fastidious in his appetite, and every means should be adopted to induce him to feed. The food that is voluntarily taken by the animal is likely to be digested and prove of support to his system; it is of infinitely more value than any form of stimulant we can administer. To support the strength of the patient by proper food, and to give as little drugs as possible, is a maxim the importance of which cannot be too strongly impressed on the student.

The first essential in the preparation of food for the sick is to have the feeding utensils perfectly clean. This is no doubt a simple matter, but one that is generally neglected, the manger, buckets, etc., usually being in a dirty condition and containing traces of sour food. The next detail of importance is the selection of the food, and here we may remark that the practitioner should examine the quality of the food intended for his patient. By so doing, he will often discover a reason why the animal refuses to feed, as he may find the hay, oats, etc., of an inferior quality.

For the sick horse food of a laxative nature is to be preferred, as it encourages a regular action of the bowels. Food of a highly nitrogenous nature is contra-indicated, as the patient is unable to take exercise, and consequently there is danger of serious derangement of the kidneys occurring if full quantities of oats be allowed.

The following may be mentioned as useful foods in cases of sickness: Bran mash, linseed and bran mash, oatmeal gruel, linseed tea, hay tea, judicious amounts of green grass, carrots, mangolds, small quantities of steamed oats, and sweet hay; milk *ad lib.* It is important to remember that the animal should be fed little and often. Too large feeds are apt to cause derangement of the digestive organs, which, during sickness of any kind, are not in their normal condition for the functions of digestion.

In convalescence from respiratory affections the evil effects of too large a feed are recognised by accelerated respirations, depending on flatulence in the stomach and intestines. As regards the selection of the food, no definite

rules can be laid down ; generally a frequent change of diet is necessary so as to tempt the appetite.

In cases of convalescence from gastric and intestinal affections care is necessary in the selection of the food so as to avoid a recurrence of the primary attack. Solid foods should be interdicted for a reasonable time, and diet of a sloppy nature substituted, until the digestive system is restored to a normal condition. Similar precautions should be taken in cases recovering from kidney affections and from azoturia. Green grass given in small amounts is a very useful form of food, and is of marked value for tempting the appetite. Indeed, we may safely state that if a horse, especially a stable-fed animal, refuses grass, it will be difficult to persuade him to take food of any kind, and we must regard his condition as very grave. Discretion is necessary in allowing food of this nature, as fresh succulent grass may produce colic and super-purgation in horses that are unaccustomed to its use. It is a safe plan to allow the grass to remain cut for an interval before giving it to the animal, or it may be mixed through his hay. In winter-time it is difficult to get grass in any quantity, but sufficient can be obtained to answer our purpose—*i.e.*, to coax the animal to feed.

Carrots in moderation are of importance in the dietary for the sick ; they may be cut up and mixed with other food, or given by themselves. Discretion is also necessary to avoid allowing too large an amount. Similar remarks apply to the use of mangolds.

A few raw potatoes are fancied by some horses when sick, but beyond this amount they are apt to prove dangerous. Boiled potatoes may be allowed in small quantities, also boiled Swedish turnips.

It must be distinctly understood that the use of such foods is to tempt the appetite, and in small amounts they cannot prove of any harm. We find it of advantage to try them in turn, as horses, like human beings, have varied tastes when ill.

Bran Mash is perhaps the most commonly known of all diets for sick horses. Its nutritive value is little ; but it acts

as a laxative, and as such is useful. Most horses quickly tire of bran. It is a matter of common experience to be told that a sick horse will eat nothing, and on examining the manger to find it full of sour bran mash. As previously remarked, it is useless allowing a large quantity of any food before a sick animal. A little care in the preparation of certain foods will render them more likely to be partaken of.

To prepare a bran mash : Get a *clean* stable bucket, scald it, and pour out the water. Put in 3 pounds of best bran and 1 ounce of salt, and add $2\frac{1}{2}$ pints of boiling water ; stir up well and cover over, allow it to stand for fifteen or twenty minutes until well cooked, and place before the animal when it is sufficiently cool.

Bran and Linseed Mash.—Take 1 pound of linseed and 3 quarts of water and boil slowly for about three hours, so that about 2 quarts of thick fluid will remain. Add 2 pounds of bran and 1 ounce of salt, stir thoroughly, cover over, and allow it to stand until sufficiently cool.

Linseed Tea.—Boil 1 pound of linseed in 2 gallons of water until the grains are soft.

Oatmeal Gruel.—Take 1 pound of oatmeal and put it into a gallon of cold water ; bring this to boiling-point, stirring it well ; then allow it to simmer over a slow fire until it becomes thick.

Hay Tea.—Scald a clean stable bucket, fill it with the best hay, and cover this with boiling water ; cover and allow to stand until cold, then strain. This drink is readily taken by some horses.

Scalded Oats in small quantities may be allowed during convalescence, and gradually increased when walking exercise is permissible.

Hay should be fresh and sweet, and allowed in small amounts at a time, not in the large mangerful that we so frequently find left in front of a sick horse.

Milk is a form of food of the highest value in all cases of sickness. Unfortunately, all horses will not drink it, even with the addition of a little sugar and water ; but a large number take to it readily, and with marked benefit. It is of

the utmost importance that the vessel containing the milk be kept scrupulously clean, and that the latter be always supplied fresh. Some horses prefer milk to be a little diluted with water, while others take it more readily if a small amount of sugar be added. It is especially in cases where solid food cannot be taken, or is interdicted, that the use of milk is indicated.

The above outline of the preparation of food for the sick can be modified according to circumstances, and we must never take it for granted that an animal's appetite is completely gone until we have tried various means of coaxing him to feed, and failed. On these occasions, which, in our experience, are not so frequent as imagined, it will be necessary to administer nourishment in the form of drenches, comprised of milk, eggs, and combined with a stimulant, such as whisky. Small quantities should be given at a time, and great care exercised so as to avoid the entry of the fluids to the trachea. When food has to be forcibly administered the cases are very serious, and frequently fatal. The custom of pouring large quantities of gruel down the animal's throat cannot be too strongly condemned. It must be remembered that the horse cannot vomit, and so is unable to get rid of ingesta that disagree with the stomach.

Water.—A remarkable prejudice exists among the attendants of horses with reference to supplying the sick animal with pure water. It is often with the greatest difficulty that we can persuade the groom to keep a bucket of cold water in the animal's stall so as to allow the horse to drink when he feels inclined. Of course, there are occasions when it is advisable to take the chill off by the addition of a little hot water, such as in cold weather, and in the case of intestinal affections. In all cases a plentiful supply of water should be allowed. It helps to reduce high temperature when that is present; it allays thirst, and is necessary for digestion, assimilation, and to promote the normal functions of the bowels and kidneys. Salines, such as Epsom salts and nitrate of potash, can be conveniently administered in the drinking water.

Grooming.—In pulmonary affections grooming should not be carried out ; it annoys the patient, and exposes the surface of the body to the cold air. The clothing should be taken off once a day and rearranged, the legs and ears hand-rubbed, and the surface of the body gently rubbed over with a soft cloth. The mouth, nostrils, eyes, and forehead should be lightly sponged with clean water. In the case of affections with a nasal discharge the nostrils should be frequently cleansed. The feet should also be carefully cleaned and attended to, and it is advisable to remove the shoes.

Exercise.—It need hardly be mentioned that during the course of febrile affections the horse should not be moved from his stall. When the temperature becomes normal, and when all evidence of acute disease has disappeared, gentle walking exercise, if the weather is fine, will prove of advantage. But this exercise must be gradual, and on no account should the animal be distressed. After recovery from gastric and intestinal disorders walking exercise is productive of good results.

The Attendant.—A reliable attendant is one of the most important attributes to the success of treatment. Not only must he carry out his instructions in a faithful manner, but he must be capable of nursing the patient and administering medicines when necessary. Too frequently we have to depend on attendants who are either ignorant on the points mentioned, or who have an exalted idea of their own skill, and imagine that constant drugging and drenching with gruel are of chief importance in treatment. Many cases of respiratory affections are seriously, if not fatally, injured by the attendant forcing fluids on the patients.

The tact of the practitioner is frequently taxed to a marked degree in his endeavours to get his instructions carried out by the attendant. Just as he has to make the best of the surroundings of the patient, so also must he be content with the capabilities and willingness of the attendant. By judicious methods of persuasion he will be far more likely to have his instructions adhered to than by adopting more forcible means.

The modern veterinary infirmary possesses marked advantages for the treatment of cases, and, whenever possible, should be availed of for this purpose.

(b) The Care and Management of Sick Dogs.

Favourite dogs constitute the majority of the canine practitioner's patients. Hence the details of arrangement and nursing are far more efficiently carried out than is the case with equine patients. As dogs are usually treated either at the houses of the owners or in a canine hospital, the hygienic surroundings are generally all that can be desired. The modern canine hospital should be so constructed that perfect ventilation and drainage are secured; while suitable arrangements for heating the apartment in cold weather should also be at hand. The apartment for the treatment of distemper cases should be perfectly isolated, properly lighted, and airy.

With reference to suitable diet for sick dogs, we have a large variety to select from. The various forms of meat extracts are easy of digestion and nourishing. Milk, to which a little lime-water may be added, is a valuable form of food, and especially indicated in affections of the stomach. In cases of gastritis even the lightest foods may not be retained, owing to the inflamed and irritable condition of the gastric mucous membrane. In such instances Brand's essence of beef may be retained when all others fail; it should be given in small amounts; of course, medicinal treatment is necessary as well.

Pet dogs are usually very fastidious in their appetites, and at times it may be difficult to ascertain what form of food suits them best. They require very careful nursing and close observation. In some cases a little raw meat chopped fine may be taken when all other food is refused.

Attention to clothing is necessary, especially in cases of fine-coated animals with thin skins, accustomed to the luxuries of the house.

The owners of dogs prove very attentive nurses. No

trouble or expense is spared in coaxing the animal to partake of nourishment, or in carrying out our instructions.

The advantage of treating cases in a canine hospital is that the details with reference to diet can be efficiently attended to, as there is often a tendency on the part of the owners to pamper the patients when the opposite course is indicated. Another advantage is that the patients are under the observation of the practitioner, and thus the facilities for complete and accurate diagnosis are greatly increased, while any necessary alteration in treatment can be promptly carried out.

CHAPTER V

THE ACTIONS AND USES OF DRUGS

IN order to treat disease in a rational manner we must possess some knowledge of the actions of drugs on the healthy body, and of the alterations in structure or function of the various organs produced by disease. We must endeavour to supply a logical reason for the employment of a certain drug, or a combination of drugs, in the treatment of each case.

Our knowledge of the action of drugs and of pathology is far from complete, and we are continually learning important facts on these subjects from experience and experiment. Hence there are many occasions on which we are unable to give a full explanation for the selection of a certain remedy, or to thoroughly understand how it brings about desired results.

In some instances we are able to arrive at a diagnosis, and we employ medicinal agents to remove the cause if possible. If the cause is beyond our control, then we adopt measures likely to influence the course of the disease in a favourable manner. In other instances a definite diagnosis is impossible, either from absence of diagnostic symptoms, or in the early stages of an affection.

The symptoms present must then engage our attention, and we select medicinal agents to counteract or modify the effects of the morbid condition. The actions of a drug are modified by certain circumstances, to which we shall now direct attention under the following headings :

I. The Mode of Administration.

As it is necessary for a drug to reach the blood before exerting its special action on the system, it follows that the more rapidly absorption occurs the quicker will be the effects produced. Hence medicines introduced directly into the blood act in a very expeditious manner, as exemplified by *intravenous injection*. This consists in the injection of solutions into the jugular vein, and is occasionally adopted for therapeutical purposes (see p. 84).

Hypodermic Injection—*i.e.*, the injection of solutions under the skin—is a rapid mode of administering certain medicinal agents. These are quickly taken up unchanged by the bloodvessels and lymphatics from the subcutaneous tissue.

By the Mouth medicinal agents reach the stomach and intestines, and this is the method most frequently adopted of administering them. They are absorbed by the vessels of the gastro-intestinal mucous membrane and enter the blood. It is a disputed point whether absorption occurs in the stomach of the horse, but in the small intestines it is very active. The rapidity of absorption depends on the nature of the drug, the form in which it is administered, and the condition of the gastro-intestinal canal. If given in the solid form and if there be a large amount of ingesta in the alimentary canal, absorption will be slow, and general effects may be uncertain.

By the Respiratory Tract absorption is very active and rapid, as is exemplified by the inhalation of chloroform and ether for anæsthetic purposes.

Intratracheal Injection—*i.e.*, solutions injected slowly into the trachea—is another example of absorption from the respiratory tract, and is sometimes employed in the treatment of purpura hæmorrhagica. It is also used in the treatment of parasitic bronchitis in cattle in order to exert a local effect on the parasites.

By the Skin absorption is slow and uncertain. Certain substances, such as mercurials applied in the form of

ointments, may become absorbed and cause constitutional symptoms in dogs. When the epidermis is removed absorption is more active. Large cantharides blisters may produce irritation of the urinary organs from the absorption of cantharidine. Carbolic acid and coal-tar products applied extensively to the skin of dogs may produce serious symptoms, or even death. Some antiseptic agents, such as iodoform, if applied freely to wounds in dogs, may cause toxic symptoms.

2. The Species of Animal.

The horse, ox, and dog show marked physiological differences in the arrangement of their nervous, digestive, and cutaneous systems. Hence medicinal agents are considerably modified in their actions in these different species. Thus emetics do not act on the horse in consequence of this animal being unable to vomit. Opium or its preparations, administered in large doses to the horse, causes nervous excitement and a tendency to walk in a circular direction. Purgatives take a considerable time to act, in consequence of the voluminous character of the intestines. Large doses of saline purgatives are required to produce their effect, and diaphoretics have little or no action on the skin.

Cattle require large doses of every form of drug in consequence of their dull temperament and the peculiar arrangement of their stomach. The drug has to pass through the first division of the stomach before reaching the true digestive portion of the organ in order to become absorbed and exert its effects.

Dogs are very susceptible to the action of purgatives and emetics, the mucous membrane of the stomach and intestines being highly sensitive. The nervous system is highly developed, and readily acted on by sedatives, narcotics, and nerve stimulants.

3. The Influence of Age and Size.

Young animals are more susceptible to the action of medicines than adults. In old animals the vital organs

become weakened and impaired, hence smaller doses are required than in the case of younger and vigorous patients. Animals vary in size, and an ordinary dose for a full-sized animal may produce serious effects in a more diminutive patient.

4. The Effect of Disease.

Alterations of the structure and functions of any organs may have a considerable effect on the action of drugs. Thus in cases of impaction of the stomach, with a paralysed condition of its walls, medicines administered in the usual manner produce no effect, the normal gastric movements are not present, and the agents given do not pass from this viscus to the intestines. In a similar condition of the intestines ordinary purgatives fail to act, and it is necessary to administer agents to restore nerve-power to the intestinal walls and to stimulate peristaltic action.

In enteritis there is very acute pain present, and large doses of sedative and anodyne agents can be administered without producing freedom from pain.

In meningitis, tetanus, etc., large doses of nerve sedatives are tolerated, and may produce little effects.

In conditions of extreme debility full doses of stimulants can be borne, and are indicated.

5. The Dose.

The quantity of a drug administered will have a material effect on its action. Thus small doses of sulphate of magnesia are alterative and diuretic, while large doses are purgative. Aloes in small doses is a tonic; in full doses it is an active cathartic.

Powerful drugs administered in carefully regulated doses are of marked therapeutical value, but if given in too large doses serious effects may ensue. A large number of drugs exert toxic actions if given in excessive doses. The physiological action of a drug—*i.e.*, a marked and distinct effect produced on the patient—results from the administration of full doses.

In therapeutics we do not as a rule desire physiological

action, but sufficient effect to suit our purpose, and this we achieve by properly regulated doses. For example, nuxvomica and its active principle strychnine are extensively prescribed as general nerve tonics, and fulfil our purpose without producing the physiological action of the drug. But in cases of paralysis we prescribe full doses, so as to produce the physiological action of the drug, which is evidenced by twitching of the muscles.

6. Frequency.

Medicines are prescribed either to be given in one dose or to be repeated at certain intervals. Thus, purgatives are given in a single dose, tonics twice daily, while stimulants and febrifuges are repeated at short intervals. Frequent administration of a drug tends to continue its action.

7. Duration, Toleration, Habit, Accumulation.

Some drugs, if administered in gradually increasing doses and for a period of time, lose their effect on the system; in other words, the system acquires a tolerance to such agents. As an example we may give arsenic. This is prescribed at first in small doses so as to avoid its irritating effect on the stomach; it is gradually increased, and after a time the animal can take doses that under other circumstances would cause toxic effects. Certain drugs are said to be *cumulative* in their action—*i.e.*, they may be administered for an indefinite period without any injurious effects, and then suddenly exert their physiological action in a marked or even dangerous degree. As examples we may give digitalis, mercury, strychnine, etc.

8. Idiosyncrasy.

Some animals possess a peculiar susceptibility to the action of certain drugs. Ordinary doses may produce severe and well-marked effects in one animal, while in another of the same species little or no action will be observed. Thus it happens that an ordinary amount of aloes may cause superpurgation, in spite of all precautions, or it may fail to

act. An ordinary blister applied to some horses may cause great irritation and constitutional disturbance. The inhalation of chloroform in some nervous horses gives rise to a marked degree of excitement, which may continue long after the usual period. We meet with instances of marked susceptibility in dogs to the action of *nux vomica*, medicinal doses sometimes producing the physiological action of the drug.

9. The Effect of Climate and Surroundings.

Narcotics act quicker in hot than in cold climates. Anæsthetics produce their effects more rapidly in hot weather than in cold; and grass-fed animals are more quickly brought under the influence of chloroform than those stable-fed and in hard condition. Ill-fed, overworked horses kept in badly-ventilated stables are more susceptible to the action of drugs than those subject to opposite conditions.

Horses in Scotland require larger doses of aloes than those in England and Ireland.

CHAPTER VI

THE ACTIONS AND USES OF DRUGS—(*Continued*)

DRUGS may be classified according to their effect on the organs and functions of the body as follows :

Drugs acting on the Mouth and Salivary Glands.

Sialagogues increase the secretion of saliva.

Aromatic bitters, dilute mineral acids, etc., acting in a reflex manner through the sensory nerves of the mouth, act as sialogogues.

Specific Sialagogues stimulate the terminations of the nerves in the salivary glands, and cause an increased flow of saliva by whatever channel they enter the system.

Examples.—Pilocarpine, physostigmine, nicotine.

Certain drugs, such as potassium iodide and mercury, act as sialagogues, by acting both reflexly on the sensory nerves of the mouth and, after absorption, by stimulating the secreting nerves of the salivary glands during excretion.

Some emetics, such as antimony and ipecacuanha, also increase the flow of saliva.

Antisialics diminish the secretion of saliva.

When salivation depends on an irritated condition of the buccal mucous membrane, substances such as chlorate of potash and borax reduce the abnormal irritability and act as antisialics.

Specific antisialics act by depressing or paralysing the terminations of the secretory nerves.

Example.—Belladonna and its active principle atropine.

Demulcents are substances of a mucilaginous nature, which have the property of protecting mucous membranes when irritated or inflamed from any cause.

Examples.—Syrups, honey, gums, glycerine, linseed tea, etc.

Drugs acting on the Stomach.

1. AGENTS INFLUENCING THE FLOW OF GASTRIC JUICE.

Alkaline Stomachics increase the flow of gastric juice when administered before feeding. They are represented by alkalies such as bicarbonate of soda.

Digestive Adjuvants assist digestion and are employed when the constituents of the gastric juice are deficient.

Examples.—Dilute hydrochloric acid and pepsin, administered with the food or after feeding.

2. AGENTS INFLUENCING THE NERVES OF THE STOMACH AND THE GASTRIC CIRCULATION.

Gastric Stimulants.—These increase the sensibility of the gastric nerves, stimulate both the local and the general circulation, cause an augmented flow of blood through the gastric vessels, increase the activity of the glands, and promote appetite.

Examples.—Vegetable bitters, such as gentian, calumba, etc., and preparations of these agents; also nux vomica, alcohol.

Gastric Sedatives reduce the sensibility of the gastric nerves.

Examples.—Opium, belladonna, bismuth, and dilute hydrocyanic acid.

Gastric Astringents depress the local gastric circulation and are indirectly gastric sedatives.

Examples.—Opium, salts of zinc, lead, tannic acid, etc.

3. AGENTS INFLUENCING THE MOVEMENTS OF THE STOMACH.

Gastric or Stomachic Tonics.—These, by increasing the acidity of the chyme, stimulate the movements of the stomach.

Examples.—Dilute mineral acids—viz., hydrochloric, nitric, and nitro-hydrochloric acids.

Nervo-muscular Gastric Stimulants.—These impart tone to the gastric nerves, restore impaired nerve power, and stimulate the movements of the stomach.

Examples.—Nux vomica and its active principle, strychnine.

4. AGENTS INFLUENCING THE CONDITION OF THE CONTENTS OF THE STOMACH.

Antacids correct excessive acidity of the ingesta, and are administered after feeding.

Examples.—Alkalies, such as the bicarbonates of soda and potassium, carbonate of magnesia, lime-water.

Gastric Disinfectants.—These are employed to correct decomposition in the contents of the stomach, to prevent the formation of gases, and to neutralise and cause expulsion of the latter when present.

Examples.—Carbolic acid, cyllin, oil of turpentine, terebene, creosote, thymol.

Emetics.—Emetics are agents which produce vomiting when administered. In consequence of physiological peculiarities the horse does not possess the power of vomiting; hence, emetics produce no effect on this animal. Similar remarks apply to the ruminant. Vomiting is very readily induced in the dog. Emetics are of two classes:

1. **DIRECT OR LOCAL EMETICS** act by irritation of the nerves of the pharynx and stomach, vomiting being produced in a reflex manner.

Examples.—Sulphate of zinc, from 10 to 15 grains in 2 ounces of tepid water; a teaspoonful each of common salt and mustard in 3 ounces of tepid water.

2. **GENERAL OR INDIRECT EMETICS** produce emesis by stimulating the vomiting centre through the medium of the blood, and act in this manner by whatever channel they enter the system.

Examples.—Tartar emetic, ipecacuanha, the yellow sub-sulphate of mercury. Apomorphine injected hypodermically in a dose of from $\frac{1}{2}$ to $\frac{1}{6}$ of a grain is the quickest and

most effectual emetic, and is invaluable in cases of irritant poisoning, as it promptly expels the contents of the stomach. Tartar emetic and ipecacuanha act both as direct and indirect emetics.

Indirect emetics produce a greater degree of nausea and depression than local emetics. They stimulate the respiratory centre, promote expectoration in the early stages of bronchitis, and, by the expiratory effects produced, tend to clear the bronchial tubes of the inflammatory products interfering with respiration.

Indirect emetics are also employed to overcome engorgement of the stomach in the dog, and to cause expulsion of foreign bodies from the cervical portion of the œsophagus.

Anti-Emetics arrest or prevent emesis and relieve nausea.

Examples.—Chloral, opium, etc., which reduce the irritability of the vomiting centre. Bismuth, dilute hydrocyanic acid, and dilute alkalies, such as lime-water, which act as sedatives to the afferent nerves of the stomach.

Drugs acting on the Intestines.

Purgatives or **Cathartics** cause evacuation of the intestinal contents. This action is brought about—

- (a) By increasing peristaltic movements of the intestine.
- (b) By causing a great increase of secretion in the intestine.
- (c) By a combination of the above actions.

Drastic Purgatives cause irritation of the intestine and congestion of the intestinal bloodvessels. They stimulate the muscular coat of the intestine, and cause energetic intestinal contractions with griping pains; and have less effect in increasing secretion than saline purgatives.

Examples.—Croton-oil, podophyllum, eserine, and barium chloride.

These agents require great discrimination in their employment.

Croton-oil is prescribed in affections of the brain to relieve congestion of the cerebral bloodvessels by directing a flow of blood to the bloodvessels of the intestine.

Eserine, with due precautions as to selection of cases and suitable doses, is employed in cases of impaction of the colon in the horse, with paralysis of its walls, and is administered in the form of hypodermic injection.

Hydragogue Cathartics cause a large secretion of fluid from the intestinal bloodvessels and speedy evacuation of the intestinal contents.

Examples.—Elaterium, gamboge, large doses of active salines.

Hydragogue cathartics are indicated in cases of dropsy in which it is desirable to remove fluid from the system by this means.

Saline Purgatives cause purgation by inducing a large secretion of fluid into the intestine; peristaltic movements are increased by the distension produced, while absorption is retarded.

Examples.—Sulphate of magnesia, sulphate of soda.

Saline cathartics, administered with proper quantities of water, are found the most effectual purgative agents for ruminants.

Simple or Ordinary Purgatives produce frequent, softened, or fluid evacuations, by increasing the intestinal secretions, but many also stimulate peristaltic action. Aloes, castor-oil, and raw linseed-oil are examples of ordinary purgatives.

Aloes is the cathartic that is employed in equine practice. It acts by increasing intestinal secretion and also by stimulating the peristaltic movements of the intestine.

For dogs a combination of purgative agents gives good results, but for ordinary cases castor-oil is safe and effectual.

Saline purgatives require to be given in large doses to produce their effect in horses; they are largely employed as laxatives and alteratives in smaller doses.

In the dog their action is uncertain, and they are likely to produce vomition.

Laxatives render the intestinal contents in a soft condition and promote action of the bowels.

Small doses of salines, sulphur, treacle, etc., have this effect, also certain foods, such as bran, roots, grass, etc.

Cholagogue Purgatives, in addition to their cathartic action, either increase the flow of bile directly, or indirectly stimulate the biliary secretion by clearing away the bile which is present in the intestine, and inducing a fresh flow.

Examples.—Mercurial preparations, such as calomel or blue pill, podophyllum, sulphate of soda, etc.

AGENTS INFLUENCING THE NERVO-MUSCULAR STRUCTURES OF THE INTESTINE.

As already mentioned, some purgatives produce their effect by stimulation of the nervo-muscular structures of the intestine and causing increased peristaltic movements. But certain drugs possess the power of stimulating the nerve-supply of the intestine and restoring nerve tone when this is deficient. Thus *nux vomica* and its preparations are extensively employed in the treatment of constipation.

When combined with a general stimulant, such as carbonate of ammonia, its action in this respect is increased, and this combination gives good results in cases of colic depending on the presence of irritating ingesta in the intestines.

SEDATIVES TO THE NERVO-MUSCULAR STRUCTURE OF THE INTESTINE.

These tend to inhibit the peristaltic movements of the intestine, and in large doses produce a condition of intestinal paralysis.

Examples.—Opium and its preparations.

THE GENERAL EFFECTS OF PURGATIVES.

In intestinal affections, such as spasmodic colic, and colic depending on the presence of irritating ingesta in the intestine, the importance of a free evacuation of the bowels is apparent.

The effect of a purgative is not merely a local one; thus bile is cleared out of the small intestine and the liver is indirectly stimulated. Deleterious substances, ptomaines,

and the products of imperfect digestion, etc., are removed from the system. Cerebral blood-pressure is lowered and congestion is relieved.

INTESTINAL ASTRINGENTS.

These agents limit the action of the bowels and correct excessive fluidity of the intestinal contents.

These effects are produced in different ways. Some act as vascular astringents by contracting the walls of the intestinal bloodvessels and lessening the amount of fluid excreted.

Examples.—Dilute mineral acids and metallic salts.

Others lessen peristaltic movements of the intestine.

Examples.—Opium and its preparations.

Antacids, such as prepared chalk, check excessive action of the intestines by diminishing the acidity of the ingesta.

Bismuth reduces the irritability of the intestinal mucous membrane and gives it a protective coating.

Catechu and substances containing tannin, cause coagulation of albumin and contraction of the small bloodvessels of the mucous membrane, and thus arrest discharges of mucus and blood.

The chief uses of intestinal astringents are in the treatment of diarrhœa, superpurgation, and dysentery.

INTESTINAL ANTISEPTICS OR DISINFECTANTS.

These agents prevent undue fermentation and inhibit the growth of bacteria in the intestine.

Some forms of diarrhœa in young animals are believed to depend on the presence of bacteria, and the administration of intestinal antiseptics gives good results.

Oil of turpentine, terebene, oil of eucalyptus, carbolic acid, cyllin, naphthalin, creosote, etc., are examples of intestinal antiseptics usually employed. Small doses of calomel possess a similar action.

Carminatives cause evacuation of gases from the stomach and intestines. These gases usually arise from excessive fermentation of the ingesta, depending on interference with normal digestion.

Carminatives tend to produce a healthy action of the muscular coat of the stomach and intestines. They also lessen spasm and pain depending on irregular or spasmodic contraction of the stomach or intestines.

By removing flatus pain is also relieved, as the distension arising from the presence of gases causes pain and distress. In tympanites of the stomach, carminatives lessen the contraction of the pyloric orifice and allow the gases to escape. Carminatives may thus be regarded as belonging to a class of drugs termed 'antispasmodics.'

Aromatic oils, oil of turpentine, terebene, alcohol, sweet spirit of nitre, spirit of chloroform, etc., are examples of carminatives. Preparations of ammonia neutralise carbonic acid gas, and may also be regarded as carminatives.

Anthelmintics are agents employed for the eradication of parasites from the alimentary canal. They include *vermicides*, which kill the parasites, and *vermifuges*, which expel them, the latter being usually of a purgative nature.

It is found that certain agents are efficacious in exterminating certain forms of parasites. Thus, for tapeworm the oil of male fern is largely employed. A useful method of treating worms in the dog is to give a purgative in the morning, and to keep the animal on a milk diet during the day, and in the evening administer from $\frac{1}{2}$ to 1 drachm of the liquid extract of male fern (or even less if a small dog) in a little chloroform-water. The next morning another purgative should be given. Areca-nut is also employed in the treatment of tapeworm.

Oil of turpentine in small doses—*i.e.*, from 5 to 15 minims, according to the size of the dog—administered in castor-oil, gives good results in some cases; but care is necessary, as the drug is liable to cause irritation of the kidneys.

In the treatment for round worms santonin and areca-nut are employed.

In cases of strongyli, in foals, calves, and lambs, oil of turpentine, carbolic acid, thymol, etc., are prescribed.

For the destruction of threadworms infesting the rectum large injections of infusion of quassia give good results.

Drugs acting on the Liver.

The secretion of bile may be increased *directly*—*i.e.*, a larger amount than usual may be made to enter the duodenum—by certain agents known as *hepatic stimulants*.

Salicylate of soda not only causes an increased flow of bile, but renders it more fluid. Dilute nitro-muriatic acid also causes increased secretion of bile.

Some agents have the power of not only stimulating the biliary secretion, but also acting as a purgative. These are termed ‘cholagogues,’ or ‘cholagogue cathartics.’

Examples.—Podophyllum, aloes, colocynth, rhubarb, euonymin, sulphate of soda, and phosphate of soda.

Others, by their special purgative action on the intestines, remove bile from the body, but have no direct stimulant action on the liver.

Examples.—Calomel and sulphate of magnesia.

Calomel is believed to act specially on the duodenum and to clear out its contents, including the bile that is present. It is frequently combined with hepatic stimulants, so that by this combination not only is bile removed from the liver, but from the system as well.

Some authorities believe that by clearing out the intestines and the bile contained therein, the hepatic cells are stimulated to secrete fresh bile.

Drugs acting on the Urinary Organs.

I. ON THE KIDNEYS.

Diuretics cause increased secretion of urine. Three classes of diuretics are recognised:

1. THOSE ACTING ON THE BLOOD, and so affecting its composition that diuresis results.

Examples.—Salines, such as the acetate of potash and the nitrate of potash. The latter produces its effect by acting on the renal circulation as well. Large amounts of fluids also act as diuretics.

2. AGENTS ACTING ON THE CIRCULATION.—Vascular and

cardiac tonics in moderate doses increase secretion of urine by raising the blood-pressure in the renal glomeruli as well as in the general circulation. If given in large doses, the renal arteries will become contracted, very little blood will enter the kidneys, and suppression of urine may occur.

Examples.—Digitalis, strophanthus, etc.

Some drugs produce diuresis by causing dilatation of the renal arteries without altering the general blood-pressure, the result being that more blood is directed to the kidneys.

Examples.—Sweet spirit of nitre, nitrate of potash.

3. AGENTS STIMULATING THE SECRETING STRUCTURE OF THE KIDNEYS—These cause diuresis in moderate doses, but if given in large amounts they may cause inflammation of the kidneys and suppression of urine.

Examples.—Oil of turpentine and volatile oils, such as oil of juniper.

Cantharides, whether administered internally or absorbed from an extensively blistered surface in the form of cantharidin, acts as a powerful stimulant to the kidneys, and is especially liable to cause nephritis and suppression of urine. Calomel and blue pill act as diuretics, but their mode of action in this respect cannot be satisfactorily explained. Some authorities believe that these agents influence tissue change in the liver, and produce substances which act as diuretics.

In practice it is found of advantage to combine diuretics of the different classes mentioned. Thus we frequently combine digitalis with sweet spirit of nitre or with nitrate of potash.

The chief uses of diuretics are to remove fluid from the tissues or serous cavities in cases of dropsy, to assist in removing the products of tissue waste in febrile conditions, and to stimulate secretion of urine in certain cases of renal diseases.

2. ON THE BLADDER.

Vesical Sedatives relieve irritability of the bladder. This condition may depend on vesical catarrh—*i.e.*, inflammation

of the mucous membrane of the bladder—with irritability of the nerves of this organ; or it may be due to excessive acidity of the urine or to the presence of an abnormal proportion of salts therein.

Irritability of the bladder is evidenced by frequent micturition, small amounts of urine being passed at each time.

Alkalies, such as bicarbonate of potash or soda, combined with hyoscyamus or belladonna, and an astringent such as buchu, act as useful vesical sedatives in cases of vesical catarrh. A liberal supply of demulcent fluids, such as barley-water or linseed tea, should be allowed in order to dilute the urine and lessen its irritating properties.

Excessive Acidity of the Urine is overcome by the administration of alkalies, and the allowance of plenty of water. Carbonate or bicarbonate of potash or soda render the urine alkaline directly—*i.e.*, they neutralise excess of acid in the stomach as well as in the urine. They render acid urates and uric acid soluble, and so prevent the formation of calculi in the kidney or bladder.

The acetates, citrates, or tartrates of potash also render the urine alkaline, but in an indirect manner. They are altered in the body from neutral to alkaline salts, become changed into carbonates, and, being excreted by the kidneys, they alter the character of the urine from acid to alkaline or neutral.

Either lime-water or carbonate of lime lessens irritability of the mucous membrane of the bladder, and is recommended in cases where a tendency to uric acid deposits exists.

Dilute mineral acids, such as hydrochloric or phosphoric acids, when administered after feeding, render the urine acid, and hence are employed in cases where there is a tendency to the deposition of phosphates in the bladder.

Vesical Tonics restore normal contractile power to the bladder, and are prescribed in cases of incontinence of urine—*i.e.*, inability to retain urine in the bladder. Cantharides stimulates both the fundus and the sphincter of the bladder. Belladonna lessens the irritability of the fundus without interfering to any degree with the functions of the sphincter.

These agents may be administered together or separately, and are occasionally found to give good results in cases of incontinence of urine. Strychnine is also a vesical tonic.

Aphrodisiacs.—Increase sexual desire by inducing increased bodily vigour.

Examples.—Strychnine, iron, nitrogenous foods.

Cantharides also possesses this action, but, as it causes considerable irritation of the urinary mucous membrane, it is not employed as an aphrodisiac agent.

Anaphrodisiacs have an opposite action to the above agents.

Examples.—Bromide of potassium, purgatives, a low diet, increased work, etc.

Ecbolics cause contraction of the uterus, and, in the pregnant animal, expulsion of the fœtus.

Examples.—Ergot, savin, etc.

In virtue of its special action, ergot is employed in cases of hæmorrhage from the uterus after the occurrence of parturition. It causes contraction of the walls of the uterus, and hence prevents bleeding from the uterine bloodvessels; it may also have a special action on the central nervous system. It is best administered in the form of ergotin, injected deeply into the gluteal muscles. Hot water injected into the uterus acts as a stimulant to the uterine fibres, and is so employed in cases of post-partum hæmorrhage.

In cases of parturition in the bitch, where the expulsive powers are feeble, ergot is employed to increase the uterine contractions. It must be used with great caution, as in full doses it may arrest the placental circulation.

In cases of retention of the placenta, ergot in combination with stimulants may produce efficient results—*i.e.*, may cause expulsion of the membranes by stimulating uterine contraction.

Drugs acting on the Mammary Glands.

Galactagogues increase the secretion of milk. Jaborandi has this effect in a temporary degree, but is not used for this purpose, and we are not aware of any drugs that are of

practical value in this respect. A healthy condition of the dam and good feeding are necessary for the proper production of milk, and a liberal allowance of milk acts as an efficient galactagogue.

An important point to remember is that certain drugs administered to the dam pass into the milk, and impart to it either their flavour or their medicinal properties; these are exemplified by purgatives, iodide of potassium, acids, opiates, diuretics, essential oils, etc.

Agents are sometimes employed to *check or diminish the secretion of milk*. The extract of belladonna applied to the udder checks lacteal secretion by paralysing the terminations of the secretory nerves; belladonna or atropine administered internally has a similar effect. Dry food, a gradual lengthening of the periods of milking, and the administration of a purgative, are the measures adopted when it is desirable to check the secretion of milk in cows. Alum is sometimes administered for a similar purpose.

Drugs acting on the Circulation.

Vaso-dilators or Stimulants of the Circulation.—It is difficult to distinguish in a satisfactory manner between agents acting on the heart itself and on the bloodvessels. Thus a drug which stimulates the heart and bloodvessels at the same time causes contraction of the latter, while the increased blood-pressure thus produced has a tendency to excite the roots of the vagus and so causes a slowing of the heart's action. Again, an agent that acts as a depressant of the heart might increase the circulation in the bloodvessels by producing in them a condition of dilatation, and so act as a vascular stimulant.

As an example of a typical stimulant of the circulation we may mention alcohol. This agent increases the pulse-rate and the power of the heart's action, while it causes dilatation of the peripheral bloodvessels and of the cutaneous vessels. These effects are not only produced by the action of the drug on the nerve centres and on the heart itself, after absorption, but also in a reflex manner, by stimulating the

gastric mucous membrane, it acts on the nerve centres and the heart. Ammonia and sweet spirit of nitre are other examples of stimulants to the circulation. Strychnine is a cardiac stimulant, as well as being a powerful respiratory stimulant.

Cardiac Depressants render the action of the heart slower and lessen its force.

Example.—Aconite.

Cardiac Tonics regulate the action of the heart and render its contractions slower and stronger.

Examples.—Digitalis, strophanthus, etc.

Digitalis not only causes slowing of the heart, but also contraction of the bloodvessels. It produces its actions in a complex manner, causing contraction of the involuntary muscular fibre of the heart and arteries, and acting also upon the intra-cardiac ganglia and the nerve centres in the medulla.

Vaso-Constrictors cause contraction of the bloodvessels, and thus lessen the supply of blood passing through them.

Examples.—Ergot, acetate of lead, etc.

Drugs acting on the Respiratory Organs.

Expectorants are agents acting on the bronchial mucous membrane, causing either increase of the secretion or rendering it more fluid and facilitating its expulsion, or they may lessen excessive bronchial secretion.

Stimulating Expectorants stimulate the circulation and respiratory centre, and tend to lessen bronchial secretion.

Examples.—Carbonate of ammonia, terebene, squills, etc.

Depressant Expectorants lower blood-pressure, render the pulse slower, and may produce nausea. They usually render the secretion thinner and more profuse.

Examples.—Ipecacuanha, antimony, etc.

In canine practice certain emetics are employed in order to get rid of catarrhal products from the respiratory passages in cases of bronchitis. During the act of vomition the expiratory efforts have the effect of clearing the bronchial tubes. Ipecacuanha and carbonate of ammonia are selected for this purpose. Medicated inhalations—*i.e.*, inhalations of

the vapour of hot water containing agents such as terebene, oil of eucalyptus, etc.—allay bronchial irritation, lessen excessive secretion, and are extensively employed in the treatment of bronchitis.

Alkalies increase bronchial secretion, while acids have the opposite effect. Iodide of potassium in small doses increases secretion from the respiratory mucous membrane to a marked degree. Belladonna, and its active principle atropine, arrest excessive bronchial secretion. Squill also tends to lessen the secretion, as well as stimulating the respiration and circulation.

Respiratory Stimulants.—Strychnine is the most powerful stimulant to the respiratory centre that we possess, and is administered for this purpose in the form of hypodermic injection. Carbonate of ammonia is also a respiratory stimulant.

Respiratory Sedatives include local applications to the chest walls, medicated inhalations, and general sedatives which tend to lessen the irritability of the respiratory centre, such as opium and its preparations.

Drugs acting on the Nervous System.

(a) **Agents acting on Motor Nerves.**—Curara has the effect of paralysing the terminations of motor nerves in the muscles, and thus causes motor paralysis; after acting for some time, paralysis of the ends of sensory nerves and of the reflex power of the spinal cord occurs as well.

Conine also paralyses the peripheral ends of motor nerves, but in addition it paralyses the motor tracts of the spinal cord.

(b) **Agents acting on Sensory Nerve-endings.**—Cold lessens the irritability of sensory nerve-endings. Cocaine and eucaine abolish the irritability of sensory nerves and thus act as local anæsthetics. Carbolic acid also acts as a local anæsthetic.

Agents acting on the Spinal Cord.

Sedatives to the Sensory Tract of the Spinal Cord.—These are represented by antipyrin, phenacetin, etc.

Sedatives to the Motor Tract of the Spinal Cord.—

These agents lessen the motor conducting power in the spinal cord, and in large doses produce paralysis. They are represented by conine and physostigmine. Cocaine given in large doses affects the motor tract of the cord as well as paralysing the ends of sensory nerves.

Spinal Stimulants.—These stimulate the motor tracts of the spinal cord, and are represented by strychnine. This, given in large doses, produces clonic convulsions—*i.e.*, each convulsion is succeeded by a period of rest, and recurs at short intervals, being readily induced by even a slight stimulus. In medicinal doses strychnine is extensively prescribed to increase the motor power of the spinal cord in cases of paralysis.

Agents acting on the Brain.

Cerebral Stimulants.—Ammonia acts as a cerebral stimulant. It stimulates the sensory branches of the vagus in the stomach and increases the action of the heart. If inhaled, it stimulates the nasal branches of the fifth nerve and causes reflex stimulation of the vaso-motor centre, resulting in increase of the blood-pressure.

Alcohol in its early actions is another example of a cerebral stimulant; it increases the circulation through the brain and acts as a general stimulant by causing dilatation of the peripheral vessels.

Strychnine stimulates the cerebral cells as well as the spinal cord.

Hypnotics or Soporifics are agents that tend to induce sleep. In horses soporific effects are not easily induced, and drugs such as opium, given in full doses, may produce nervous excitement.

In canine practice we employ soporific agents in cases where patients are restless, and sleep is interfered with by the presence of pain or nervous irritation from various causes.

Bromide of potassium depresses the functional activity of the brain, and produces this effect by lessening the excitability of the entire organ. It thus acts as a cerebral sedative and also tends to produce sleep.

Chloral hydrate acts directly on the cerebrum and lessens the excitability of the brain-cells; it also dilates the blood-vessels throughout the body and acts indirectly as a soporific. In canine practice anodyne agents, such as opium and morphine, act as soporifics, and are indicated when sleep is interfered with by the presence of pain; they relieve the pain, either at its source, or they prevent the cerebrum from receiving the painful impressions.

Anodynes are agents employed for the relief of pain. They belong to a class of drugs known as narcotics.

Narcotics include a large number of medicinal agents; they exert a disturbing influence on the functions of the brain, and their actions in this respect vary according to the doses given.

Anæsthetics also belong to the group known as narcotics. These are agents used to produce a condition of insensibility to pain during the performance of surgical operations, and are represented by *chloroform* and *ether*.*

A number of drugs possess an anæsthetic action if administered in large doses, but by the time anæsthesia is induced a fatal paralysis of the vital nerve centres occurs.

Chloroform and ether produce first a stimulant effect, evidenced by struggling on the part of the animal; this is succeeded by a narcotic stage, in which the functions of the brain are disturbed and a state of semi-unconsciousness induced; next comes the stage of anæsthesia, in which movement and feeling are abolished. If the agent be pushed still further, a paralytic stage is reached and paralysis of the respiratory and other vital centres occurs.

Alcohol in very large doses produces similar effects to those mentioned, but the stages are much more prolonged and uncertain.

Ether is slower in its action than chloroform, its exciting effects are more marked and prolonged, while it has less

* Local anæsthetics are agents which, if either painted on a part or injected subcutaneously, produce loss of sensibility therein by causing paralysis of the peripheral endings of sensory nerves. They are represented by cocaine and eucaine.

power of paralysing muscular fibres and the vital nerve-centres. In consequence of the prolonged period of excitement it induces, and the uncertainty of its action in horses, ether is not employed as an anæsthetic for these animals, chloroform being safe and effectual for this purpose. But in dogs ether is largely adopted as an anæsthetic.

Opium and morphine prevent the perception of afferent impressions from all parts of the system. They depress the nerve-endings in the stomach and intestines, and in all internal organs; also they interfere with the transference of impressions to the cerebrum, and have the effect of dulling the latter. In the horse opium and morphine in large doses produce a condition of excitement and a tendency to walk in a circular direction.

Indian hemp in full doses exerts a profound narcotic effect on the horse, the animal assuming a sleepy appearance, with drooping eyelids, and appearing unconscious to surrounding influences, although usually retaining the standing posture.

Belladonna in full doses stimulates the nerve-centres and paralyses the peripheral ends of nerves. In toxic doses it causes a form of delirium, characterised by restlessness and weakness in movement, the latter being due to the paralysing effect of the drug on the terminations of motor nerves.

Agents acting on Tissue Change.

Alteratives produce favourable changes in the processes of nutrition and repair. Their mode of action is not readily explained; they produce their effects gradually, and in an indefinite manner they alter and improve morbid conditions of the body.

Examples.—Iodide of potassium in cases of rheumatism, arsenic in affections of the skin.

Tonics are agents which tend to restore normal tone—*i.e.*, the normal degree of vigour and tension of parts. Tonics are classified as follows:

Cardiac Tonics strengthen the heart's action.

Examples.—Digitalis, strophanthus, strychnine.

Hæmatic Tonics or Hæmatinics improve the quality of the blood.

Examples.—Preparations of iron, manganese.

Intestinal Tonics improve the tone of the intestinal tract.

Examples.—Nux vomica, etc.

Nervine Tonics restore tone to the nervous system.

Examples.—Strychnine, arsenic, quinine.

Stomachic or Gastric Tonics increase the appetite and promote digestion.

Examples.—Vegetable bitters, dilute nitro-hydrochloric acid.

Antipyretics or Febrifuges are agents which lower abnormal temperature.

Examples.—Quinine, phenacetin. Alcohol acts as an antipyretic by dilating the vessels of the skin, and also by lessening oxidation in the body.

Spirit of nitrous ether also dilates the cutaneous vessels, and tends to lessen abnormal temperature.

Some agents reduce abnormal temperature by increasing the loss of heat from the body. These are represented by antipyrin, antifebrin, and phenacetin. Others, such as quinine, act as antipyretics by lessening the production of heat in the body.

Agents acting on the Skin.

Diaphoretics increase the cutaneous secretions. In veterinary practice the action of diaphoretics is uncertain, and copious perspiration is seldom to be obtained. The agents in ordinary use for this purpose are repeated doses of sweet spirit of nitre and acetate of ammonia, together with warm clothing and a proper temperature of the surroundings.

Diaphoretics produce their effect either by stimulating the sweat-glands or their nerves, or by increasing the cutaneous circulation.

Anhydrotics or Antihydrotics are agents which lessen the secretion of sweat.

Example.—Atropine. This produces its effect by paralysing the ends of the secreting nerves in the sweat-glands.

Drugs which stimulate the respiratory centre act as anhydrotics in cases of debility, in which a venous condition of the blood tends to cause abnormal sweating.

Examples.—Nux vomica, strychnine, etc.

Drugs acting on the Surface of the Body.

Counter-irritants are agents which, if applied to the skin, produce either stimulation or inflammation of this structure, the effects depending on the agent employed or on the strength of the application. Counter-irritants are classified as follows :

(a) **RUBEFIACIENTS** produce congestion of the cutaneous vessels, and are represented by mild applications of mustard, and liniments containing ammonia and turpentine. Owing to the colour of the skin in animals, the reddening of this structure, which occurs in man as the result of the application of rubefacients, is not always to be observed.

(b) **VESICANTS OR EPISPASTICS** cause the formation of vesicles or blisters of various sizes. These contain an albuminous fluid and a small amount of fibrin. In a variable time they rupture and dry up ; the part becomes scaly, and a new epidermis is produced.

Examples.—Cantharides and strong applications of mustard.

(c) **SUPPURANTS OR PUSTULANTS** cause inflammation of the deep-seated portions of the skin and the formation of pustules.

Examples.—Biniodide of mercury, croton-oil. Vesicants, if applied in too concentrated a form and repeated, have a similar effect.

The *actual cautery* is very frequently employed as a counter-irritant in cases of diseased joints, ligaments, and tendons.

The thermo-cautery has now superseded the old-fashioned heated iron, as it possesses the advantages of convenience, neatness in operation, and very little blemish as the result of its employment.

Uses of Counter-irritants.—In the treatment of respiratory affections, such as pneumonia and pleurisy, the application of counter-irritants to the walls of the chest is

advised by some authorities. The manner in which such a mode of treatment brings about favourable results is not definitely known. Some believe that the vessels in the lung and pleura adjoining the blistered region become dilated, and thus relief is given to the inflamed part, such as occurs after the application of heat. Others state that the stimulus caused by the application of the blister to the chest-walls is transmitted by the afferent nerves to the vaso-motor centre, and is then reflected down the vaso-motor nerves to the pulmonary vessels, causing them to contract. At the same time, the vessels of the thoracic wall, and probably of other parts, are made to dilate by the stimulus being reflected down the vaso-dilator fibres. By these actions it is believed that blood is withdrawn from the lungs, and pulmonary congestion is lessened.

Counter-irritants are also employed to hasten absorption of inflammatory products, such as are present in cases of pneumonia. Their action in this respect is believed to depend on their power of increasing circulation through the affected part.

Counter-irritants are largely employed in the treatment of chronic inflammatory conditions of tendons, ligaments, and joints. They modify the nutrition of the affected parts, and assist the process of repair and the absorption of the exudate. In the case of joint affections, such as bone-spavin, the use of the actual cautery produces a reparative inflammation, which has the effect of assisting the natural process of locking the affected bones together and preventing motion between them. Lameness is thus removed.

In the treatment of open joint, if after the acute inflammation has been subdued by suitable means the synovia continues to flow, the application of a cantharides blister to the whole surface of the joint is recommended by authorities as the most successful form of treatment. The beneficial effects are explained by the action of the blister in limiting motion, assisting the process of repair, and, by inducing swelling, bringing the surfaces of the wound together. Blisters are also employed to hasten the maturation of abscesses, such as those of strangles.

Cold and Hot Applications.—The application of cold water lessens the supply of blood going to a part by causing contraction of the arteries. Ice and evaporating lotions have a similar effect.

Hot applications dilate the capillaries, increase the superficial circulation, relieve pressure on the nerves, and thus diminish pain in an inflamed part.

Poultices are applications which relieve tension, pain, and inflammation by supplying heat and moisture to a part (see p. 88).

Caustics and Escharotics destroy living tissue when brought into contact with it. They produce this effect by combining with the water and albumin of the part. Those which produce an extensive slough are termed 'escharotics.' Caustics are employed for the purpose of suppressing exuberant granulations in wounds, and for hastening the process of healing when this is slow. Nitrate of silver and sulphate of copper are the agents usually preferred for this purpose. Caustics are also employed for destroying virus in wounds, and for the removal of warts when the latter cannot be excised with safety. Even after warts have been surgically removed, it is advisable to apply an efficient caustic to the part in order to prevent them from recurring. For these purposes the thermo-cautery judiciously used proves most effective. Other caustics employed are pure carbolic acid, chloride of zinc, etc.

Styptics are agents employed for the purpose of arresting hæmorrhage. Some act mechanically, such as the application of tow with pressure. Others are astringents, and act either by coagulating albumin and plugging the bleeding vessels, or by causing contraction of the capillaries. Styptics are represented by tincture of benzoin, acetate of lead, perchloride of iron, etc. The actual cautery at one time was largely employed to suppress hæmorrhage, but is now often superseded by surgical measures. A solution of adrenalin has been lately introduced as a styptic, and it proves useful in minor operations. It acts by contracting capillary vessels. Styptics are also used in the treatment of internal hæmor-

rhage. For this purpose ergot is usually employed, either in the form of ergotin hypodermically or as the extract administered as a drench.

Astringents contract the capillary vessels of a part, coagulate or precipitate albumin, lessen excessive discharges, and check the formation of exuberant granulations. They are represented by acetate of lead, sulphate of zinc, alum, etc.

Antiseptics either prevent the entrance of micro-organisms into a wound or inhibit their growth if present. Thus, they prevent or destroy putrefaction.

Examples.—Perchloride of mercury, carbolic acid, chinosol, cyllin, lysol, iodoform, peroxide of hydrogen.

Disinfectants destroy the germs of disease, and prevent fermentation and putrefaction. They are employed for preventing the spread of infectious and contagious diseases, and are applied to buildings, floors, etc., in various ways for this purpose.

Examples.—Carbolic acid, Jeyes' Fluid, chloride of lime.

Deodorants absorb gases and neutralise foul odours.

Examples.—Charcoal, solutions of permanganate of potash, etc.

Action of Drugs on the Eye.

Mydriatics cause dilatation of the pupil.

Examples.—Belladonna, atropine, hyoscyamine.

Myotics cause contraction of the pupil.

Examples.—Physostigmine, pilocarpine, morphine.

Astringents for Ophthalmic Purposes.—The agents generally employed as astringents are solutions of sulphate of zinc or nitrate of silver, protargol.

Antiseptics.—Solutions of boric acid are generally prescribed for this purpose.

Sedatives.—Solutions of cocaine, atropine, or eucaine are those preferred.

Local Anæsthetics are represented by solutions of cocaine or eucaine.

CHAPTER VII

ON PRESCRIBING

THE utilisation of medicinal agents in the treatment of a case of disease is termed prescribing. A prescription is a written direction, containing the constituents to be employed, the quantities of same, and the method of administration.

To prescribe in a rational manner we must be acquainted with the actions and uses of drugs, with the doses of each, and with the circumstances that modify their actions. The latter have already been referred to (see p. 43). The following points must now receive attention :

The Selection of the Remedy is the first point to be considered when prescribing for a case. The diagnosis having been made—or, failing this, the prominent symptoms carefully observed—an agent must be selected which is likely to influence the course of the disease in a favourable manner, or to act on the cause and remove it whenever this is possible.

In selecting a medicinal agent discrimination is necessary, as certain drugs possess actions some of which may prove undesirable, if not detrimental, to the case. Experience has proved the value of some medicinal agents over others in special diseases. Occasionally the selection is a matter of choice, while in some instances the therapeutical value of certain drugs is open to doubt, and founded on theoretical evidence. Of late years the number of new remedies has increased to a large extent, but the advantages which these are supposed to possess over known and tried agents are often

not verified in practice. When selecting the remedy, the prescriber has also to decide the form and preparation of it which it will be most expedient to employ.

Contra-indications.

Certain conditions of disease render some medicinal agents or some particular line of treatment improper, undesirable, or even harmful. Thus purgatives are contra-indicated in enteritis, as their action would increase the diseased condition present. Stimulants are contra-indicated in acute affections of the brain; diuretics possessing irritating actions in nephritis; hepatic stimulants in cases of jaundice depending on obstruction in the bile-duct. Opium or its preparations should not be given in cases of colic or intestinal impaction, as it tends to interfere with peristaltic action, and induces a paralysed condition of the intestinal walls.

All depleting measures are contra-indicated in diseases of a debilitating nature—*e.g.*, purgatives should not be given in cases of respiratory affections or of influenza. Opium is contra-indicated in extensive respiratory affections, accompanied by shallow, embarrassed breathing; in congested and inflammatory conditions of the brain; and in nephritis. This subject will again receive attention when the medicinal uses of each drug are under consideration.

The Combining of Drugs—Chemical and Physiological Incompatibles.

While it is often found of advantage to combine drugs in a prescription, care should be taken to avoid prescribing a greater number than is absolutely necessary. A prescription containing several medicinal agents is evidence of doubt and indecision on the part of the prescriber, and indicates that he is not familiar with the conditions that require therapeutical attention.

In the combining of drugs the subject of chemical and physiological incompatibility must be understood. Drugs

are said to be *chemically* incompatible if, when combined, chemical reaction occurs, and the resulting compound becomes either inert or dangerous.

Examples.—Persalts of iron are incompatible with agents rich in tannin, chlorates with iodides, acids with alkalies. As examples of dangerous combinations resulting in explosive mixtures, we may mention chloride of lime with sulphur, chlorate of potash with sulphur, oil of turpentine with sulphuric acid, etc.

Occasionally we do combine agents that are chemically incompatible. For example, the well-known white lotion, so extensively employed as an astringent application, is a combination of acetate of lead with sulphate of zinc in water. The resulting compound consists of acetate of zinc in solution, with sulphate of lead as a precipitate. Acetate of lead and opium are incompatibles occasionally combined in the form of lotions. Tincture of iron and gentian are incompatibles, but their combination is found a useful one.

Drugs are said to be *physiologically* incompatible when they possess totally opposite actions, so that if combined and administered no therapeutical effects are produced in the system. For example, nux vomica is a stimulant to the spinal cord and general nervous system, while bromide of potassium and chloral hydrate are nervous sedatives. Obviously to combine these agents would be irrational and useless. A knowledge of the antagonistic action of drugs enables us to prescribe suitable *antidotes* in cases of poisoning.

The Dose.—The dose is the amount of a drug which it is safe to administer, and which is likely to produce desired results. As already mentioned (p. 45), there are circumstances which lead us to modify the dose. The recognised doses are arranged from the smallest to the largest that can be administered with safety. Of course, the size of the patient must be taken into account, and it is often difficult to compute the amount that will fulfil the conditions of efficiency and safety.

The question of the dosage for young animals must receive attention. As a general rule, yearlings take one-third of the

dose suitable for an adult, two-year-olds half the dose, and three-year-olds two-thirds.

Dogs vary in size to such an extent that much discrimination is necessary in prescribing suitable doses, especially for the smaller varieties. It is always judicious to commence treatment with small doses, and more especially is this the case with powerful drugs such as strychnine and arsenic.

Time.—Some medicinal agents are prescribed to be given before feeding, and others either in the food or after feeding. Thus alkaline stomachics, if given before feeding, have the effect of increasing the secretion of gastric juice; if given after food, they check excessive acidity of the gastric contents. Acid stomachics are given after food in cases where the natural acid is deficient. Drugs which tend to irritate the gastric mucous membrane, such as arsenic, are prescribed either with the food or after feeding.

The Prescription.

The prescription should indicate in a clear manner the medicinal agents prescribed, the form or preparation of those which are selected, the amount of each, the dose of the resulting combination, and the directions for use.

Prescriptions are usually formed on the following plan:

1. **The Superscription**, \mathcal{R} , which is an abbreviation of recipe—*i.e.*, take.
2. **The Inscription**, or body of the prescription. This contains the names and quantities of the ingredients.
3. **The Subscription**, or directions to the dispenser.
4. **The Signature**, or directions with reference to the dose and method of administration, etc. This is preceded by the abbreviation 'sig,' representing *signa*—*i.e.*, mark.

The names of the drugs and the preparations of same are written in Latin in the genitive case, and the quantities are expressed by certain symbols and numbers. The directions for use are generally written in English, although it is permissible to use certain Latin abbreviations for this purpose; but as these have to be translated by the dis-

penser, the former method is advisable in order to avoid a possible source of error.

The typical prescription contains the following headings :

1. **The Basis**, or active drug which has been selected.
2. **The Adjuvant**. This is intended to assist or hasten the action of the basis.
3. **The Corrective** limits or modifies the action of the basis.
4. **The Vehicle or Excipient** is an agent added to render the combination in a convenient form for administration.

A familiar example of the above may be found in the preparation of the ordinary physic ball for the horse. In this the *basis* is Barbadoes aloes; the *adjuvant* is the extract of belladonna, which assists the action of the aloes; the *corrective* is ginger or oil of peppermint, which is added to prevent griping; and the *vehicle* or *excipient* may be soap or treacle, which renders the bolus of a proper consistency.

Of course, it is not necessary that all prescriptions should contain these component parts, as in many all that is required is the basis and the vehicle or excipient.

Abbreviations used in Prescriptions.

āā (*avā*), *ana*—of each. When two or more consecutive ingredients are ordered in equal quantities, the abbreviation *āā* is placed after the last.

Ad. Up to (the full phrase being “quantum sufficit ad”). This is used to signify that the vehicle is to be added until a certain quantity is reached.

Bol. Bolus—a ball.

Bis ind. Bis indies—twice daily.

C. Cum—with.

Div. Divide.

Elect. Electuarinum—an electuary.

Ft. Fiat—let it be made, make.

F. m. Fiat mistura—make a mixture.

Gr. Granum—a grain.

Haust. Haustus—a draught.

Lin. Linimentum—a liniment.

Lb. Libra—a pound.

Lotio. A lotion.

M. Misce—mix.

Mistura. Mixture.

Mitte. Send.

Minimum. A minim, the $\frac{1}{60}$ part of a drachm.

O. Octarius—a pint.

Pil. Pilula—a pill.

Pulv. Pulvis—a powder; pulverizatus—powdered.

Q.s. Quantum sufficit—a sufficiency.

Rep. Repetatur—let it be repeated.

Spts. Spiritus—spirits.

Ss. Semis—a half.

Sig. Signa—mark.

Tr. Tinctura—a tincture.

Ungt. Unguentum—an ointment.

Weights and Measures, and Symbols of Same.

WEIGHTS.

Libra : 1 pound = 7,000 grains; symbol, lb. i.

Uncia : 1 ounce = 437.5 grains; symbol, $\bar{\text{z}}$ i.

Drachma : 1 drachm = 60 grains; symbol, $\bar{\text{z}}$ i.

Granum : 1 grain; symbol, gr. i.

The *Scruple* (= 20 grains; symbol, ḡ i.) is still occasionally employed.

It will be observed that, according to the above table, 8 drachms will represent 480 grains, and hence are equivalent to more than 1 ounce. In the abolished Apothecaries' Weight the ounce was equivalent to 8 drachms, or 480 grains.

MEASURES.

Congius : 1 gallon = 8 pints = 10 lb.; symbol, C.i.

Octarius : 1 pint = 20 fluid ounces = $1\frac{1}{4}$ lb.; symbol, O.i.

Uncia : 1 fluid ounce = 8 fluid drachms = 437.5 grains; symbol, f. $\bar{\text{z}}$ i.

Drachma : 1 fluid drachm = 60 minims = 54.68 grains; symbol, f. $\bar{\text{z}}$ i.

Minimum : 1 minim = $\frac{9}{160}$ grain; symbol, ḡ i.

Medicines are sometimes measured by the drop, but this is not always safe or accurate. A drop of a mobile liquid is much smaller than a drop of water. The amount will also

vary according to the size and form of the neck of the bottle from which it is measured.

Measuring by Domestic Utensils.

This method, in consequence of the variation in size of domestic utensils, cannot be accurate, but is often found convenient.

Common tumblers	= 8 to 10 fluid ounces.
Teacups	= 5 to 7 fluid ounces.
Breakfast cups	= 8 to 10 fluid ounces.
Wineglasses	= 2 to $2\frac{1}{2}$ fluid ounces.
Tablespoons	= $\frac{1}{2}$ fluid ounce.
Dessertspoons	= 2 fluid drachms.
Teaspoons	= 1 fluid drachm.
A pint wine-bottle	= about 13 fluid ounces.
A quart wine-bottle	= about 27 fluid ounces.
A Scotch pint	= 60 fluid ounces.

The Metric System of Weights and Measures.

WEIGHTS.

The *Gramme*, which is taken as the unit of weight, is the weight of a cubic centimetre of water at 4° C. or $39\cdot2^{\circ}$ F.

The following are the approximate equivalents of the Metric to the ordinary system. They are not strictly accurate, but sufficiently so for practical purposes.

1 gramme	= about $15\frac{1}{2}$ grains ; symbol, gm.
1 decigramme	= $0\cdot01$ gramme = about $1\frac{1}{2}$ grains.
1 centigramme	= $0\cdot01$ gramme = about $\frac{1}{8}$ grain ; symbol, cgm.
10 centigrammes	= about $1\frac{1}{2}$ grains.
$0\cdot065$ gramme	= 1 grain.
4 grammes	= about 1 drachm.
30 grammes	= about 1 ounce.
1 kilogramme	= 1,000 grammes = 2 pounds $3\frac{1}{4}$ ounces.

MEASURES.

1 cubic centimetre	= about 17 minims.
1 litre	= 1,000 grammes of water = 1 pint 15 ounces.
$3\frac{1}{2}$ cubic centimetres	= 1 drachm of water.
30 cubic centimetres	= 1 ounce of water.
1 millilitre	= 1 gramme of water.

In using the Metric System it is important to distinguish carefully between the symbols for gramme and grain, as errors have occurred in this direction.

The symbol for gramme is Gm., with a capital initial letter, to distinguish it from gr., the usual contraction for grain. The symbol for cubic centimetre is c.c.

In order to avoid possible errors on the part of the dispenser, the names of drugs should be written in full when the abbreviated designations might appear doubtful. Thus the term *ac. hydroc. dil.* is erroneous and dangerous, as it might signify dilute hydrochloric acid or dilute hydrocyanic acid. Again, the term *hyd. chlor.* might be taken for calomel or corrosive sublimate, and should not be used.

The doses of mixtures are usually computed according to domestic measures—for the horse in wineglassfuls, and for the dog in tablespoonfuls, teaspoonfuls, etc. For the horse, mixtures are usually ordered in quantities of a pint; and for the dog, from 2 to 8 ounces.

In computing the requisite amount of each drug for a certain quantity of mixture, so that each dose ordered of the latter will contain a medicinal dose of the constituents, the following rule will assist: First, ascertain the number of doses the proposed quantity of mixture will contain, next decide the medicinal dose of each agent selected, then by multiplying the former by the latter the proper amount will be obtained.

Example.

R Sodii bicarb.	$\bar{3}\text{ii.ss.}$	= $2\frac{1}{2}$ ounces.
Tr. nucis vom.	$\bar{5}\text{x.}$	= 10 drachms.
Tr. gentianæ co.	$\bar{3}\text{v.}$	= 5 ounces.
Aquæ	ad O.i.	= 1 pint.

F.m.—Sig.: Give two wineglassfuls three times a day in a pint of water.

The above, which is a prescription for an alkaline stomachic mixture for the horse, contains five doses, each being equivalent to 4 ounces.

The amount of sodii bicarb. in each dose will be $\frac{1}{2}$ ounce, of Tr. nucis vom., 2 drachms, and of Tr. gentian co., 1 ounce.

Again, an 8-ounce bottle of mixture will contain about 16 tablespoonfuls, or 32 dessertspoonfuls, or 64 teaspoonfuls. A 4 ounce bottle will contain about 8 tablespoonfuls, or 16 dessertspoonfuls, or 32 teaspoonfuls.

In prescribing antiseptic or other solutions the following table will prove useful. The amounts are not strictly accurate, as they are calculated so as to avoid fractions; but for practical purposes they will be sufficiently exact.

1 part to 1,000 parts =	$\frac{1}{10}\%$	about	$\frac{1}{2}$ gr. to $\bar{f}\bar{3}i.$	= 9	gr. to Oi.
1 " to 500 "	= $\frac{1}{5}\%$	"	1 gr. to $\bar{f}\bar{3}i.$	= 18	gr. to Oi.
1 " to 100 "	= 1 %	"	$4\frac{1}{2}$ gr. to $\bar{f}\bar{3}i.$	= 90	gr. to Oi.
1 " to 80 "	= $1\frac{1}{4}\%$	"	$5\frac{1}{2}$ gr. to $\bar{f}\bar{3}i.$	= 3	dr. to Oi.
1 " to 50 "	= 2 %	"	9 gr. to $\bar{f}\bar{3}i.$	= 2	dr. to Oi.
1 " to 40 "	= $2\frac{1}{2}\%$	"	11 gr. to $\bar{f}\bar{3}i.$	= $3\frac{1}{2}$	dr. to Oi.
1 " to 20 "	= 5 %	"	22 gr. to $\bar{f}\bar{3}i.$	= 7	dr. to Oi.
1 " to 10 "	= 10 %	"	44 gr. to $\bar{f}\bar{3}i.$	= $1\frac{3}{4}$	oz. to Oi.
1 " to 5 "	= 20 %	"	$1\frac{1}{2}$ dr. to $\bar{f}\bar{3}i.$	= $3\frac{1}{2}$	oz. to Oi.
1 " to $2\frac{1}{2}$ "	= 40 %	"	3 dr. to $\bar{f}\bar{3}i.$	= $7\frac{1}{4}$	oz. to Oi.
1 " to 2 "	= 50 %	"	$3\frac{1}{2}$ dr. to $\bar{f}\bar{3}i.$	= 9	oz. to Oi.
1 " to $1\frac{1}{4}$ "	= 80 %	"	6 dr. to $\bar{f}\bar{3}i.$	= $14\frac{1}{2}$	oz. to Oi.

The following table shows the more accurate calculation :

1 part to 1,000 parts =	$\frac{1.0}{1000}$	=	0.437	gr. to $\bar{3}i.$	=	8.75	gr. to Oi.
1 " to 500 "	= $\frac{1.0}{500}$	=	0.875	gr. to $\bar{3}i.$	=	17.5	gr. to Oi.
1 " to 100 "	= 1 %	=	4.37	gr. to $\bar{3}i.$	=	87.5	gr. to Oi.
1 " to 80 "	= $1\frac{1}{4}\%$	=	5.46	gr. to $\bar{3}i.$	=	1.82	dr. to Oi.
1 " to 50 "	= 2 %	=	8.75	gr. to $\bar{3}i.$	=	2.9	dr. to Oi.
1 " to 40 "	= $2\frac{1}{2}\%$	=	10.93	gr. to $\bar{3}i.$	=	3.62	dr. to Oi.
1 " to 20 "	= 5 %	=	21.87	gr. to $\bar{3}i.$	=	7.25	dr. to Oi.
1 " to 10 "	= 10 %	=	43.75	gr. to $\bar{3}i.$	=	14.5	dr. to Oi.
1 " to 5 "	= 20 %	=	87.5	gr. to $\bar{3}i.$	=	29	dr. to Oi.
1 " to $2\frac{1}{2}$ "	= 40 %	=	2.9	dr. to $\bar{3}i.$	=	58	dr. to Oi.
1 " to 2 "	= 50 %	=	3.64	dr. to $\bar{3}i.$	=	72.5	dr. to Oi.
1 " to $1\frac{1}{4}$ "	= 80 %	=	5.8	dr. to $\bar{3}i.$	=	116	dr. to Oi.

CHAPTER VIII

ON THE ADMINISTRATION OF MEDICINES

THE administration of medicines to animals is a procedure that requires considerable skill and tact, and is one in which the student should render himself proficient. Not only is it of importance that the remedies prescribed should be administered without waste, but also without danger to the patients. Many attendants of animals are very careless and ignorant in these respects, and we know from experience how difficult a matter it is to insure the safe and effectual administration of medicinal agents, more especially in the case of horses and cattle.

Balls are a very convenient method of administering drugs in the solid form. All waste is avoided, and when skilfully administered very little discomfort is caused to the patient. The disadvantages are that many attendants are not adepts in the giving of balls, and that medicines in the solid form require a considerable time to become dissolved and in a fit condition for absorption, especially in disordered states of the alimentary canal. If we can insure skilful administration, this method is far preferable to the employment of drenches in the treatment of respiratory affections when it is found necessary to prescribe medicinal agents.

Balls are now prepared with a special dura-plastic covering and of a convenient shape, which renders their administration far easier than was the case with the old-fashioned form. In administering a ball the most important points are not to excite the animal and to secure a proper hold of his tongue with the left hand. In order to prevent

the head being raised too high, an assistant should keep his hand on the animal's nose. The ball is held between three fingers of the right hand, and the latter, being in the form of a cone, is passed rapidly along the palate, and the ball pushed gently into the region of the pharynx; the hand is then quickly withdrawn, and the tongue released. The animal's head should be held up until the ball is seen to descend along the gullet. In some cases it may be necessary to allow the animal to take a few mouthfuls of water, which produces the desired effect.

Some horses resent the administration of medicines in this form, and work the jaws vigorously when the hand enters the mouth. In such instances, in order to avoid injury to the hand from the animal's teeth, it is necessary to employ a balling-iron, or a special instrument termed a balling-gun. The practice of using a sharp-pointed stick for this purpose cannot be too strongly condemned, as such has often caused injury to the pharynx and soft palate. Unskilful administration, by which a ball becomes broken in the horse's mouth, is frequently the cause of the animal resenting the taking of this form of medicine on a future occasion. Some horses persistently cough and reject the bolus, no matter how carefully it is administered, and even when it is well lubricated. In such cases medicine must be administered either as a drench or in the food.

In Cattle, medicines in the solid form are seldom administered, as they enter the rumen, and their effect is slow and uncertain, in consequence of the large amount of ingesta therein.

In the Dog, medicines are conveniently administered in the form of pills or tablets. These are now prepared in a manner that renders them easy of administration. A pill or tablet can be given to the dog by placing it with the fingers at the back of the animal's tongue, and holding the jaws together until swallowed.

Instruments called pill-carriers are sometimes used for this purpose, and prove effectual and convenient. A popular method of giving the dog a pill is to enclose it in a piece of

meat; this is readily bolted by the animal. If he is suspicious, it is advisable to first offer him meat without the medicine; the medicated portion is then taken without any trouble. Medicines in the solid form can also be administered in gelatine capsules, the flexible variety being the most easily given.

Drenches or Draughts are the form in which fluid medicines are administered. Considerable care is necessary in the process, so as to avoid the fluid gaining an entrance to the trachea, and thus setting up mechanical bronchitis. The animal's head should not be held too high, the tongue should be left perfectly free, and if the animal makes an attempt to cough, the head should be immediately released. The drench should be administered slowly, so as to avoid danger and prevent waste. Drenches should be administered out of a properly made tin drenching-bottle.

If in cases of emergency a glass bottle has to be used, care should be taken to select one of stout material and with a strong neck, so as to avoid the risk of the latter getting broken in the animal's mouth. In cases of laryngitis, pharyngitis, and, indeed, in the majority of cases of respiratory affections, drenching should be avoided, as there is great danger of the fluid finding its way into the trachea during a fit of coughing. This is very easily induced, in consequence of the irritable condition of the respiratory passages. We are quite convinced that the indiscriminate practice of giving drenches in cases of this kind is productive of many serious, if not fatal results.¹

In Cattle, similar precautions are necessary. The animal's head should not be held too high, and the head and neck should be kept in a straight line as much as possible. Many fatal results occur from the ignorant and careless administration of drenches to cattle. In cases of milk fever, drenching is both dangerous and unnecessary. This disease

¹ Mr. C. Hartley, F.R.C.V.S., of Lincoln, has invented a very convenient instrument for the administration of medicines in such cases. It is termed a medicine gun. The medicinal agents are dispensed in a semi-solid form by admixture with tragacanth or liquorice-powder; the requisite amount is placed in the receptacle at the end of the instrument, the latter is passed along the roof of the mouth, and, by means of a piston, the medicine is deposited at the back of the tongue.

is now treated successfully by the injection of an antiseptic solution or of air into the udder.

In the Dog, medicines in the fluid form are usually administered with facility. The best method is to distend the cheek with the finger so as to form a pouch, and to pour the fluid into this from the corner of the mouth. It readily finds its way through the teeth, and is swallowed without trouble.

Powders are a safe and convenient method of administering medicines to the horse and dog. They should not contain substances having a disagreeable taste or smell, as otherwise they will be refused by the patients. Powders are given to the horse either in the food or drinking water. If possessing any taste or smell they should be first mixed in cold bran-mash and then incorporated with the food. If mixed with warm food their smell and taste are increased. Salines are readily taken in the drinking water, and substances such as magnesium sulphate, sodium sulphate, and sodium bicarbonate can be administered in this manner.

In the dog, medicinal agents are best mixed with sugar, and are then taken in the food without difficulty ; or tasteless powders, such as bismuth nitrate or carbonate, can be placed on the back of the tongue.

Electuaries are prepared in a semi-fluid condition, and are administered by placing the required dose between the molar teeth or on the back of the tongue. Their employment is indicated when swallowing is difficult, such as in cases of acute laryngitis or in tetanus.

Inhalations.—The inhalation of steam medicated with various agents is of marked therapeutical value in cases of respiratory affections. A perfect method of administration has not yet been discovered for the horse. The usual plan is to fill a stable bucket three-quarters full of boiling water, pour in the medicinal agent selected, which is usually some antiseptic volatile oil, cover the top of the receptacle with hay, stir the contents with a stick, and hold the animal's head over the steam that arises.

The practice of covering the horse's head with a sack containing the bucket cannot be too strongly condemned,

as it interferes with respiration, and the animal resents the state of partial suffocation that is induced.

In canine practice a special apparatus is devised for the administration of medicated inhalations.

Suppositories are soft medicated masses of a conical shape, intended for insertion into the rectum, and producing therapeutical effects by their local action. Glycerine suppositories contain 70 per cent. by weight of glycerine, and are used in cases of constipation in the dog. Nutrient suppositories contain peptonized beef, and are capable of being absorbed from the rectum, thus furnishing in the dog a means of supplying nutriment when feeding by the mouth is impossible.

Hypodermic Injections.—These are administered by means of a special syringe, of which many forms capable of being rendered aseptic by boiling are now made.

The best form of hypodermic needle is that known as Roux's. Being very fine, its insertion is not resisted by the animal.

The situation chosen for injection is usually the lower part of the neck or the back of the elbow, as the skin in these regions is thin and the subcutaneous tissue loose. Take up a fold of skin between the finger and thumb of the left hand, detach the needle from the syringe and pass it through the skin, carrying it for about an inch in an oblique direction under the surface. Attach the syringe containing the solution to the needle, and inject the fluid slowly. Strict antiseptic precautions should be observed.

The injections of the various serums for preventive and curative purposes are carried out in a similar manner.

Intravenous Injections.—The jugular vein is the vessel usually selected in the horse. The injection should be properly diluted; it should be non-irritant, and introduced slowly. The introduction of air must be avoided, and aseptic precautions should be rigidly adhered to. By this method the medicinal agent, being injected directly into the blood-stream, acts more rapidly than by any of the others. It is occasionally employed in the administration of certain drugs—*e.g.*, barium chloride (see p. 117), and silver colloid in the treatment of purpura hæmorrhagica (see p. 126). The intravenous injec-

tion of normal saline solution has proved to be one of the most important means of treating surgical shock and collapse (see p. 103).

Intratracheal Injections are employed in the treatment of parasitic bronchitis in calves, the medicinal agents being injected into the trachea, and thus acting directly on the parasites. This method is occasionally employed in the treatment of purpura hæmorrhagica, a solution of iodine being injected into the trachea (see p. 156). A special syringe is necessary. One of the spaces between the rings of the trachea is selected in the upper third of the neck, the needle is then inserted, and the fluid slowly injected from the syringe. The needle requires to be very strong. Some practitioners prefer to make a small opening in the skin before inserting the needle. Care should be taken to insure that the needle enters the trachea, and not the surrounding tissues.

Of late years another method of administering medicines has been tried, which consists of introducing the agents into the large intestine of the horse and the rumen of the cow by means of a long, narrow trocar and cannula, to which is attached an indiarubber syringe. It has been successfully employed in cases of tympanites, and has also been adopted in administering medicines in cases of milk fever, when drenching is dangerous.

Enemata.—Enemata are fluids of various compositions which are injected into the rectum for the following therapeutical purposes:

1. To procure evacuation of the bowels. For this purpose the simplest form is warm water, with soap rubbed up in it. In some cases olive-oil, raw linseed-oil, glycerine, or a solution of aloes is employed. The effect of an enema is not only to cause expulsion of the fæces contained in the rectum, but by reflex action peristalsis is encouraged beyond the surface reached by the injection. For the horse and ox, the best form of instrument for administration of enemata is a Read's pump, to which is attached a gum-elastic tube, about 2 feet in length.

The rectum is first cleared of its contents by the hand, and the tube, well lubricated with lard, is carefully intro-

duced; the fluid is then slowly pumped in. In cases of impaction of the colon, the simple injection of fluid into the rectum is not likely to be of much service, especially when we consider that the latter is about 2 feet in length and the floating colon about 10 feet. In such cases the rectum tube devised and recommended by Colonel F. Smith, A.V.D., should be employed. This is 6 feet long, and requires considerable care and skill in order to introduce its full length into the intestine. The best agent to lubricate the instrument is either lard or lanolin, as these are less likely to be removed during the process of insertion.

No force should be used; the fluid should be pumped in slowly from the commencement, and as the bowel becomes distended, the tube can be readily passed along into the floating colon. Care must be taken that the tube does not bend on itself, which is likely to occur if it is passed in too quickly or any force used. From 5 to 15 gallons of water may be introduced, or even more, and as a portion is likely to be retained, good results are often achieved. Colonel Smith prefers cold to warm water, and advises that large quantities be introduced.

In cases of retention of the meconium in foals, which so often proves a cause of intestinal obstruction, our chief reliance in treatment is on the diligent administration of enemata. A long rectum-tube, similar to that used for large dogs, is employed for the purpose, and the use of warm olive-oil frequently proves effectual in softening and causing expulsion of the hardened masses that obstruct the lumen of the intestine (see p. 469).

For the dog, enema-syringes of special make and rectum-tubes of various sizes are required. In all animals care must be taken to avoid injury to the intestine when introducing rectum-tubes, and on no account should any force be used. The fluid to be injected should not be too hot; this is tested by immersing the point of the elbow therein, not the hand—an error which is frequently made.

In cases of obstruction in foals and in dogs, it is often necessary to remove hardened fecal masses by the fingers

when they are within reach, or a blunt spoon may be employed for the purpose, care being taken to avoid any injury to the mucous membrane of the intestine. Enemata of glycerine are often employed in order to promote evacuation of the fæces. The agent is injected undiluted—from 2 to 4 drachms for the dog and from 2 to 4 ounces for the horse (see p. 373).

2. Enemata, consisting of boiled starch medicated with opium, act as sedatives and astringents in cases of severe diarrhœa; they should be small in quantity and injected very slowly.

3. In painful inflammatory conditions of the pelvic organs enemata of warm water exert a soothing effect.

4. Enemata containing substances such as decoctions of quassia or common salt are employed to destroy and remove parasites infesting the rectum.

5. Nutrient enemata are usually composed of nutrient substances in a form which is capable of being freely absorbed. They are employed in cases where swallowing is difficult or impossible, also in acute gastritis with obstinate vomiting in the dog.

For the horse, one or two pints of linseed-tea, with milk and eggs, may be employed, repeated four or five times in the twenty-four hours; if introduced at a temperature of 100° F., they are more likely to be retained. Strong beef-tea is sometimes given in this manner, and if necessary stimulants such as wine or whisky may be added.

For the dog, peptonized beef may be given in solution, but suppositories containing this substance are more likely to be retained and absorbed.

Injections of medicated fluids are employed in the treatment of diseased conditions of the nasal passages, the uterus, urethra, and bladder. For washing out the uterus in cases of metritis, or after the removal of a decomposed placenta, the ordinary Read's injection pump can be employed.

Poultices possess emollient properties, and are employed for the local application of heat and moisture. They may be composed of linseed-meal, oatmeal, or bran, stirred into

boiling water until the proper consistency is obtained. Boiled turnips or carrots are often employed as poultices in country districts. Spent hops form a light poultice, and are recommended as such in the treatment of acute mammitis.

The chief uses of poultices are: (1) in the treatment of punctured wounds, especially of the feet; (2) in favouring the maturation of abscesses; (3) in canine practice, linseed poultices are employed in the treatment of pulmonary affections, and are best applied in the form of a jacket specially made to contain the poultice and fit the sides of the chest. They are also employed in the treatment of painful abdominal affections. Poultices should be changed at intervals, so as to insure a proper temperature and cleanliness.

In former times it was the practice to apply poultices in the routine treatment of wounds, but in the present day we find that dry antiseptic dressings give far better results. We have also learned that in the case of punctured wounds which have become painful and inflamed the use of boric lint poultices is far preferable to linseed-meal (see p. 171).

Discretion is necessary in prescribing poultices. If continued for too long a period they produce a softened condition of the part, with the formation of unhealthy granulations, and healing is greatly delayed. In the treatment of punctured wounds of the feet, much damage is done by the too long continued use of poultices. If linseed-meal poultices are employed, they should be rendered antiseptic by the addition of agents such as cyllin or lysol.

In applying poultices to the chest or abdomen, they should not be too heavy, as otherwise distress is produced. They should also fit close to the surface of the skin, so as to produce therapeutical effects. As a substitute for poultices, a combination termed 'thermofuge' has been introduced. It is said to be a mixture of aluminium silicate, glycerine, boric acid, menthol, thymol, eucalyptus-oil, and ammonium iodide. It is applied to the part spread on linen.

Fomentations are employed to relax and soothe congested or inflamed parts, and also in the treatment of strains, contusions, etc. They lessen tension and abate pain. Fomenta-

tions usually consist of hot water, medicated or otherwise. The temperature of the water should be determined by circumstances. For the eye it should not exceed 100° F. Above 110° F. it produces irritation.

In applying fomentations to strains, etc., the method will vary according to the region of the body affected. In punctured wounds of the foot the part can be kept immersed in a special tub containing hot water, more of the latter being added at intervals to keep up the required temperature. In such cases an antiseptic agent should be added to the water. The limbs can be fomented by means of a flannel cloth wrung out of hot water, a mild stimulating liniment being afterwards applied in cases of strains to prevent chilling of the part.

Fomentations should not be applied too hot, and discretion is necessary in deciding the cases in which they should be employed and the length of time their use should be continued. In swellings of the limbs of a septic nature, and in cases of erysipelas affecting this region, fomenting with hot water proves a disastrous form of treatment, as it increases the tendency to sloughing of the skin and underlying structures. The application of lead and belladonna lotion, the affected part being then thickly enveloped in cotton-wool and carefully-adjusted bandages, is the treatment indicated in such cases.

Baths.—In equine practice the employment of baths, either hot or cold, is not general. The large extent of the horse's skin, and the difficulty of overcoming the evil effects of excessive reaction and of drying the animal thoroughly, are drawbacks which interfere with the value of baths in this animal. The Turkish bath, when the process is thoroughly carried out, is of marked value in the treatment of rheumatism, renal affections, and certain diseases of the skin. Great care is necessary so as to avoid any danger of chills. In canine practice hot baths are frequently employed in the treatment of acute rheumatism, convulsions, etc. Their temperature may range from 97° F. to 110° F.¹

¹ For a description of the luminous heat bath, see Appendix.

CHAPTER IX

VETERINARY PHARMACY

MOST veterinary surgeons dispense the medicines required in their practice, and for many reasons this system is one to be commended. The student should render himself proficient in the art of dispensing by spending a proper period of time with a practitioner; not only does such a pupilage teach him the manual part of the work, but also it enables him to become familiar with the appearance of the various drugs, their uses and doses. In the present day much labour and time is saved in dispensing, as wholesale chemists prepare boluses and pills according to the formulæ we order. Of course, these are composed of agents that will keep well, such as aloetic balls for horses, purgative and tonic pills for dogs, etc. In a busy practice it is absolutely necessary to keep in stock preparations ready for dispensing, such as chlorodyne, and the various lotions and liniments that are used in everyday work.

It is irrational, however, to depend too much on ready-made preparations, as it interferes with the proper treatment of individual cases. The practice of prescribing preparations made by chemists, the formulæ of which are trade secrets, cannot be too strongly condemned. If any ready-made preparation be employed we should be aware of its exact composition, and of the doses of each agent that a given quantity will represent.

A book should be kept in which all prescriptions dispensed in the pharmacy should be entered. This is not only useful

for reference, but it will enable us to refute any allegations of injury caused by the medicinal agents which we have dispensed. Explicit directions should be written on each bottle or package of medicine sent out, and poison labels should be affixed to articles that require this designation. Lotions and liniments should have distinctive labels, so as to avoid any danger of their misuse.

Powders must be thoroughly ground and mixed in a pestle and mortar before being divided and folded in paper.

In the case of poisonous agents, such as arsenic, each powder must be weighed separately. In canine practice triturations are necessary and convenient. For example, arsenic, which is prescribed in doses of $\frac{1}{30}$ to $\frac{1}{20}$ grain, may be mixed with sugar of milk, so that a given quantity of the resulting triturate will be equivalent to the above doses. Thus, if 3 grains of arsenic are triturated with 10 drachms of milk-sugar, then 10 grains of the resulting triturate will be equivalent to $\frac{1}{20}$ grain of arsenic. As powders containing vegetable medicinal agents do not keep well, it is not prudent to have a large amount of these ready for use.

Balls or Boluses are prepared by mixing the ingredients finely powdered in a mortar, and brought to a proper consistence by the addition of excipients, such as soap, liquorice, syrup, treacle, etc. Empty gelatine capsules of various sizes can now be procured, in which the ingredients can be enclosed in the dry form; these are very convenient, and can be administered with facility.

Physic balls containing the requisite doses of aloes are now usually prepared by wholesale chemists. Messrs. Wyleys and Co., Coventry, prepare what are known as the dura-plastic horse-balls; these are covered with an air-tight but soluble material, and are of a very convenient shape for administration. With ordinary care, the contents retain their activity for a long period; and this form of ball is now extensively used.

For canine practice, pills containing the medicinal agents and combinations in everyday use are prepared. They are covered either with gelatine or sugar; they keep well, and are

easily administered. Tabloids and tablets prepared according to recognised formulæ are also largely used.

Mixtures and Drenches are prepared in the pharmacy as required for use. Mixtures containing insoluble substances, such as bismuth, require the aid of mucilage to hold the agents in suspension. In canine practice it is necessary to add syrup, which may be of various kinds, to mixtures, in order to disguise the taste of bitter drugs, and thus render administration easier.

Drenches containing substances likely to cause irritation of the mouth and throat, such as oil of turpentine, chloral hydrate, or preparations of ammonia, should be diluted with raw linseed-oil, milk, treacle, or mucilage. Directions should also be written on the label, and verbal instructions given that the drench must be well shaken prior to administration.

Ointments are usually prepared in bulk. The basis, which is generally vaseline or lanolin, or equal quantities of each, is first melted, and the ingredients in a finely-powdered condition are then stirred in; while in order to blend the materials properly, and to avoid any dry particles appearing in the mass, it is advisable to complete the preparation by thoroughly mixing it in a suitable mortar.

In preparing the ointment of biniodide of mercury, which is largely employed as a counter-irritant, it is advisable to mix the mercuric iodide in some olive-oil before blending it with the basis, which should be melted.

Blisters are usually dispensed in 2-ounce ointment boxes; they should have distinctive labels containing directions for use.

Drugs, especially those containing definite active principles, are not always of uniform strength. In order to overcome this difficulty, Messrs. Parke, Davis and Co., London, prepare *Standard Fluid Extracts*, which are adjusted to a uniform strength by assay, irrespective of the quantity of crude drug required. A large number of important drugs cannot be standardized chemically, and this firm has adopted a physiological test for such medicinal substances, their activity being determined by their physiological action when administered

to animals. Such drugs as digitalis, Indian hemp, and ergot are tested in this manner, and thus the preparations which are supplied are thoroughly reliable.

The standard fluid extracts are very convenient, and keep well. They are far stronger than the usual tinctures and extracts, and by diluting them with alcohol, tinctures of the official strength can be prepared. If the fluid extracts are dispensed as such, of course the doses must be modified considerably, in consequence of their greatly increased strength, and in order to avoid precipitation of resinous materials when diluted with water, it is necessary to add a small amount of glycerine. The strength of these various fluid extracts is given on the bottles containing them, also the amount of dilution with alcohol necessary to prepare the ordinary British Pharmacopœia tinctures.

Hypodermic Injections are now conveniently prepared from pellets containing the correct dose of the alkaloids or active principles. These are far preferable and more reliable than made-up solutions, which do not keep well. They are readily dissolved in a small amount of water when required for use.

In a country practice a portable medicine-chest is a necessity, in order that immediate treatment may be carried out in urgent cases, as otherwise considerable delay would be caused before the requisite drugs could be obtained. Instrument-makers supply convenient chests for this purpose, capable of containing sufficient medicinal agents for an emergency.

In concluding the subject of dispensing, we may remark that neatness, order, and accuracy should be observed in the veterinary pharmacy. All stock bottles containing poisonous substances should be distinctly labelled and kept by themselves. Slovenly methods of dispensing are not calculated to inspire confidence in clients, and there is no excuse for an ill-kept, untidy pharmacy. Order and method are just as necessary in dispensing as they are in every other department of veterinary practice.

PART II

THE MATERIA MEDICA

CHAPTER I

INTRODUCTORY

BEFORE proceeding to consider the actions and uses of the most important agents of the *materia medica*, it will be necessary to draw attention to the preparations of drugs that are usually employed. As no recognised Veterinary Pharmacopœia is in existence, we usually select the preparations as laid down by the British Pharmacopœia, unless for special purposes, when stronger preparations than those of the latter are found more efficient and convenient.

Aquæ (waters) are weak solutions of volatile oils and other agents in distilled water.

Example.—Aqua camphoræ.

Decoctions are prepared by boiling the drug in water.

Example.—Decoctum hæmatoxyli.

Infusions are prepared by digesting vegetable substances in hot water.

Example.—Infusum digitalis.

Extracts are obtained by evaporating the expressed juice of fresh plants or the soluble constituents of dried drugs.

Green extracts are those prepared from fresh plants.

Example.—Extractum belladonnæ viride.

Fluid extracts are concentrated solutions of the active principle of a drug, usually prepared so that 1 ounce of the extract equals 1 ounce of the drug.

Glycerina are solutions of medicinal agents in glycerine.

Example.—Glycerinum belladonnæ.

Tinctures (spirits) are solutions of medicinal agents in rectified spirit.

Example.—Tinctura opii.

Mixtures are prepared by dissolving medicinal agents in water. They are frequently compound.

Liniments are fluid preparations for external application ; they usually contain soap, oil, or spirit as a basis, and are applied with friction or simply painted on a part.

Lotions are solutions intended for external use, and are applied in various ways.

Ointments are applied externally, and consist of a basis of either vaseline, lard, or lanolin, with which the medicinal agents are blended.

Powders are prepared by reducing drugs by trituration to a state of fine division.

Alkaloids are the active principles of vegetable drugs ; they are alkaline in reaction, and readily combine with acids forming salts soluble in water. All contain nitrogen ; some drugs may contain more than one alkaloid, the latter differing in their actions from each other. Alkaloids have the termination 'ine' or 'ina.'

Examples.—Morphine, atropine, physostigmine, cocaine.

Neutral Organic Principles are another form of active concentrated vegetable drugs, prepared by complex processes. They are represented by digitalin, aloin, santonin, and are distinguished from alkaloids by having the terminal 'in.'

The Materia Medica

may be divided into the following groups for convenience of description :

GROUP I.—Alkalies and alkaline earths.

GROUP II.—The metals.

GROUP III.—The non-metallic elements.

GROUP IV.—Acids.

GROUP V.—Water.

GROUP VI.—The carbon compounds.

GROUP VII.—The vegetable kingdom.

GROUP VIII.—The animal kingdom.

CHAPTER II

GROUP I.—ALKALIES AND ALKALINE EARTHS

OF these the most important are : (1) Potassium, (2) Sodium, (3) Ammonium, (4) Calcium, (5) Magnesium.

I. POTASSIUM AND ITS MEDICINAL SALTS.

GENERAL ACTIONS.—Potassium salts are rapidly absorbed and quickly excreted; they increase the alkalinity of the blood in a transient manner. In large doses they depress the heart, lower blood-pressure, and, finally, paralyse the nerve-centres. Potassium salts vary in their actions according to their composition. Thus, caustic potash is *irritant* and *caustic*; the nitrate and acetate of potassium are *diuretics*; while the iodide and bromide of potassium possess the specific actions of iodine and bromine respectively.

Potassæ caustica—Hydrate of potash : caustic potash.

Liquor potassæ—Solution of caustic potash.

PREPARATION.—**Liquor potassæ** is prepared by boiling slaked lime in a solution of the carbonate of potassium, and then decanting. **Caustic potash** is prepared from liquor potassæ by boiling it down quickly, and pouring the residue into pencil-shaped moulds.

ACTIONS.—Caustic potash in full doses is an irritant corrosive poison.

Externally it is a penetrating caustic, and its action in this respect is difficult to control.

USES.—Neither of these preparations of potash is prescribed internally.

Externally, caustic potash is often employed as an applica-

tion to prevent the growth of horns in young cattle. It is seldom used as a caustic. Liquor potassæ is recommended in combination with creosote and olive-oil as an efficient dressing in the treatment of follicular mange in the dog (see p. 216).

Potassii carbonas—Carbonate of potassium; carbonate of potash.

Potassii bicarbonas—Bicarbonate of potassium; bicarbonate of potash.

PREPARATION.—The carbonate is prepared from pearl ash. The bicarbonate is prepared by saturating a strong aqueous solution of the carbonate with carbonic acid, and recrystallising.

DOSES OF THE BICARBONATE.—Horses, $\bar{3}$ ss. to $\bar{5}$ i.; cattle, $\bar{3}$ i. to $\bar{5}$ i.ss.; sheep and pigs, $\bar{3}$ ss. to $\bar{5}$ i.; dogs, grs. x. to grs. xl. Administered twice daily, either mixed in the food or properly diluted in the form of a mixture.

ACTIONS.—The carbonate in toxic doses and in concentrated form is an irritant corrosive poison. The bicarbonate does not possess this irritating effect, and is the salt prescribed for internal use. It is an *antacid*, it increases the alkalinity of the blood and urine, and acts as a *mild diuretic*.

Externally, both salts act as stimulants and cleansers of the skin.

MEDICINAL USES.—As an *antacid*, the bicarbonate of potassium is prescribed after feeding; it neutralises excess of acid in the stomach, and also lessens irritability of the gastric nerves. If administered before feeding, it stimulates secretion of gastric juice and increases appetite. The bicarbonate of soda is, however, preferred for producing these effects in cases of dyspepsia.

In *rheumatism*, the bicarbonate is prescribed as an antacid and alterative; it neutralises excess of acid in the system, increases the flow of urine, and renders it alkaline. In uric acid deposits, sometimes met with in the dog, and in calculi of the bladder and urethra of rams, the bicarbonate is recommended to assist in their removal.

In *cystitis* and in irritable conditions of the bladder, the

bicarbonate is prescribed in combination with hyoscyamus; it renders the urine alkaline, and reduces vesical irritability.

Externally, carbonate of potassium is added to applications for the treatment of parasitic skin diseases. It softens the cuticle, and enables the active agent to reach the parasites.

An emulsion of carbonate of potassium, olive-oil, and water forms a useful dressing for blistered surfaces.

Potassii nitras—Nitrate of potassium; nitrate of potash; nitre; saltpetre.

PREPARATION.—Prepared from solutions of the native salt by crystallization.

DOSES.—Horses, ʒii. to ʒss.; cattle, ʒi.; sheep and pigs, ʒss. to ʒi.; dogs, grs. x. to grs. xx. Repeated twice daily.

INCOMPATIBLES.—Sulphuric acid and some sulphates.

ACTIONS.—Nitrate of potassium is an *alterative*, *febrifuge*, and *diuretic*. It is excreted chiefly by the kidneys, also from the bronchial mucous membrane and the skin increasing the secretions from these organs. Its diuretic effect depends on its action as a vascular stimulant to the kidneys. Some authorities believe that nitrate of potassium undergoes a certain amount of reduction in the system, nitrites being formed, which produce a dilating action on the renal blood-vessels. It is believed to lessen the coagulating power of the blood.

In toxic doses it produces fatal gastro-enteritis, irritates the kidneys, and paralyses the heart and nervous centres. Fatal cases of poisoning have occurred in cattle as the result of this agent being sold and administered in mistake for Epsom salt.

ANTIDOTES.—Mucilaginous substances should be freely administered, such as linseed-tea, white of egg, olive-oil, etc. If collapse supervenes, stimulants are indicated. Opiates should be given to allay pain.

Externally it acts as a *refrigerant*.

MEDICINAL USES.—As an *alterative* and *febrifuge*, nitrate of potassium is very frequently prescribed in febrile conditions and catarrhal affections. It produces beneficial results by promoting the bronchial, cutaneous, and urinary

secretions, and assisting in the elimination of effete products. For these purposes it is combined with febrifuge doses of Epsom salt, and is readily taken when dissolved in the patient's drinking-water.

As a *diuretic*, it is largely employed in cases of œdematous conditions of the limbs, lymphangitis, etc. In cases of renal disease it should be used with caution, in consequence of its action on the bloodvessels of the kidneys. It is *contra-indicated* in acute inflammation of these organs.

The acetate of potash is believed to be a safer diuretic in cases of renal disease, as it acts by increasing the activity of the renal epithelium, and has little, if any, action on the bloodvessels of the kidneys.

Externally, potassium nitrate is employed in combination with sal ammoniac and water as a refrigerating lotion.

Potassii chloras—Chlorate of potassium; chlorate of potash.

PREPARED by passing chlorine gas into a mixture of the carbonate, or chloride of potassium and slaked lime, boiling, evaporating, and recrystallising.

DOSES.—Horses, ʒii. ; cattle, ʒss. ; sheep and pigs, grs. xx. to grs. xl. ; dogs, grs. v. to grs. xv. Repeated twice daily, and administered in the form of powder, mixture, or electuary.

INCOMPATIBLES.—Sulphur and tannic acid, which form explosive mixtures with it; also charcoal, ferrous salts, and hydrochloric acid.

ACTIONS.—It increases the secretion of the salivary and buccal glands, and also stimulates bronchial secretion, thus acting as a *saline expectorant*. It produces an *antiseptic* effect on the blood, but its action in this respect is as yet unexplained. If added to blood drawn from the body, it increases the power of coagulation, produces a firm condition of the coagulum, and retards decomposition. It is excreted by the bowels and kidneys in an unchanged condition.

Toxic doses act as gastro-intestinal irritants, cause disintegration of the red blood-corpuscles, and the presence of hæmoglobin in the urine.

Externally, chlorate of potassium is a *local stimulant*, and also possesses antiseptic actions.

MEDICINAL USES.—As a *saline expectorant*, it is employed in cases of laryngitis, pharyngitis, and bronchitis. It may be administered in the drinking-water or in the form of an electuary, in combination with extract of belladonna, glycerine, or honey.

In cases of purpura hæmorrhagica it is largely prescribed, and is believed to exert beneficial effects by its special action on the blood.

It has been recommended in the treatment of that disease known as *red-water* in cattle; but other lines of treatment have given better results.

In prescribing chlorate of potassium, large doses should be avoided, as they are likely to produce gastro-intestinal irritation.

Externally, chlorate of potassium in solution forms a useful mouth-wash in cases of aphthous eruptions and ulcerations in the region of the mouth, and in irritated conditions of the tongue and buccal membrane. For these purposes it is combined with borax, honey, and water.

Potassii acetat—Acetate of potassium; acetate of potash.

PREPARED by saturating acetic acid with carbonate of potassium, evaporating, and solidifying.

DOSES.—Similar to those of the nitrate.

ACTIONS AND USES.—It is an active diuretic, producing this effect by increasing the activity of the renal epithelium, and not by dilating the bloodvessels of the kidney. It renders the urine alkaline. It is employed as a diuretic in cases of dropsy and in renal affections.

Potassii permanganas—Permanganate of potassium; permanganate of potash.

PREPARED by evaporating a mixture of black oxide of manganese, chlorate of potassium, and solution of caustic potash.

PREPARATIONS.—Liquor potassii permanganatis (1 in 100 of distilled water). Condy's red disinfecting fluid contains permanganate of potassium and sodium.

ACTIONS AND USES.—It is a *disinfectant*, a *deodorant*, and

also an *antiseptic*; but other agents are more reliable and cheaper for these purposes. Condyl's Fluid diluted with 50 parts of water is employed as a uterine injection in cases of retention of the placenta.

In the treatment of snake-bite, Sir T. Lauder Brunton recommends the application of permanganate of potassium to the wound, either in the form of crystals or a saturated solution of the agent.

It is an antidote to opium and morphine, also to phosphorus, strychnine, colchicum, and oxalic acid.

Potassii iodidum—Iodide of potassium (see Iodine, p. 153).

Potassii bromidum—Bromide of potassium (see Bromine, p. 159).

Potassii citras—Citrate of potassium—is an antacid and a diuretic, occasionally employed in canine practice.

Potassii tartras acidus—Bitartrate of potassium; cream of tartar—is a mild cathartic and a diuretic; it is seldom used in veterinary practice.

II. SODIUM AND ITS MEDICINAL SALTS.

General Actions of Sodium Salts.

Sodium salts have not the depressing effect on muscles, nerve-centres, and nerves that are possessed by those of potassium. They are less diffusible, more slowly absorbed and excreted, and, as they are normal constituents of the body, they are less useful as alteratives than the corresponding salts of potassium. Some are *irritant* and *caustic*, such as the hydrate and carbonate. Others, such as the sulphate and chloride, are *diuretic* and *alterative* in small doses, but act as *cathartics* in large amounts. Again, there are others, such as the bromide and the iodide, whose actions resemble those of bromine and iodine respectively.

Sodii bicarbonas—Bicarbonate of sodium; bicarbonate of soda.

PREPARED by saturating a solution of the carbonate of sodium with carbonic acid gas.

DOSES.—Horses, ʒii. to ʒss.; cattle, ʒss. to ʒi.; sheep and pigs, grs. xx. to grs. xxx.; dogs, grs. x. to grs. xx.

Repeated twice daily, or according to circumstances. It can be administered either in the form of powder or mixture, and is readily taken in the drinking-water.

ACTIONS.—The carbonate and bicarbonate only differ as regards the degree of their action; and in consequence of the tendency of the carbonate to irritate, the bicarbonate is almost invariably prescribed. If administered before feeding, bicarbonate of soda stimulates the secretion of gastric juice. Given with the food or after feeding, it *corrects excessive acidity* and *checks undue fermentation* of the ingesta. It possesses a slight *diuretic* action, and is a *gastric sedative*.

MEDICINAL USES.—In cases of gastric indigestion, it is largely employed, either alone or in combination with nuxvomica and carminatives. It corrects acidity, and neutralises the organic acids which arise from fermentation of the gastric ingesta.

As a gastric sedative, it is prescribed in combination with bismuth in cases of gastric catarrh.

As an *antacid*, it is a very useful agent in the treatment of excessive acidity of the stomach, which is evidenced by the animal licking the walls, eating clay, etc.

In cases of what are known as ‘stomach coughs’ in horses and dogs, the administration of full doses of bicarbonate of soda in the drinking-water often gives good results. These coughs depend on gastric irritation, which produces reflex irritation of the larynx or pharynx.

Sodii chloridum—Chloride of sodium; common salt.

SOURCE.—Native.

DOSES.—As a *purgative*: cattle, lb.ss., with an equal amount of Epsom salt; sheep, ʒss. to ʒi.ss., with a similar amount of Epsom salt. As a *stomachic and alterative*, 2 or 3 ounces may be given to horses or cattle twice daily mixed in the food.

ACTIONS.—The chloride of sodium promotes digestion and assimilation, and a proper allowance of this agent is as necessary for animals as for human beings. In full doses it acts as a *saline cathartic* in ruminants, but its action in this respect in horses is violent and uncertain. Toxic doses are *irritant*, and produce *gastro-enteritis*.

MEDICINAL USES.—In the form of rock-salt, this agent should be allowed to horses and cattle both in the mangers and on the pasture. As a top-dressing for pastures, it is highly recommended by men of experience, and is stated to prevent the occurrence of red-water and certain parasitic diseases.

As a cathartic for cattle, the chloride of sodium is often combined with Epsom salt, and is believed to increase the action of the latter. In the early stages of *red-water* in cattle, $\frac{1}{2}$ pound of chloride of sodium liberally diluted with fluid is recommended by some practitioners. Sodium chloride is used as a popular emetic for the dog, 1 or 2 teaspoonfuls, with half a teaspoonful of mustard flour dissolved in 4 ounces of warm water, being given for this purpose.

In the treatment of surgical shock occurring during or after operations, and in cases of hæmorrhage, collapse, etc., also in exhaustion appearing during the course of debilitating diseases, the intravenous or subcutaneous injections of solutions of sodium chloride prove very useful. They raise the blood-pressure, and in cases of severe hæmorrhage supply fresh fluid to the circulation; and it is believed that physiological saline solution can take up oxygen and give it off to the tissues.

The usual solution employed contains 1 drachm of sodium chloride to 1 pint of boiled (sterilised) water. Convenient tablets are prepared by chemists for making these solutions, each containing 30 grains of sodium chloride; and two of these dissolved in 1 pint of sterilised water form a solution of the required strength, termed 'normal saline solution.' Some surgeons prefer what is termed 'physiological saline solution,' which can be prepared with tablets, each containing the following agents:

R. Sodii chlor. ...	...	gr. xxv.
Sodii sulph. ...	...	gr. $i\frac{1}{4}$.
Sodii carb. ...	...	gr. $i\frac{1}{4}$.
Sodii phosph. ...	...	gr. i.
Potass. chlorid. ...	...	gr. i.ss.

Two of these dissolved in a pint of sterilised water form the required solution.

The solution, at a temperature of 100° F., is injected into any convenient vein at the rate of about a pint per ten minutes. For the horse the jugular is selected. A special aspirating-needle is carefully inserted, and to this a piece of tubing is attached; the fluid can be allowed to flow into the latter by means of a funnel, or a large syringe can be employed for the purpose. Care must be taken that no air is permitted to enter the vein, and that the inner coat of the latter is not injured; also the strictest aseptic precautions must be adopted.

In the dog any superficial vein can be selected. This is exposed, a double ligature passed underneath it; the distal end is tied; an incision is made in the other end, and a metal nozzle with a bulbous end inserted, and secured with a single twist of the ligature. A piece of tubing is attached to a small glass funnel, the tubing is clamped, and the funnel filled with the solution. The free end of the tubing is attached to the nozzle. Now compress the vein before relieving the clamp; shake the apparatus, holding the funnel vertically. If any air has entered the nozzle it will ascend and escape. Next release the pressure on the vein, and allow the solution to enter it. If a syringe is used, the piston should be withdrawn slightly before the fluid is injected; this will withdraw any air that may have gained entrance. In case a further injection of the fluid may be necessary, the ligature may be left long, so that the vein can readily be got at. If not necessary, the ligature can be cut short, and an antiseptic dressing applied to the part.

Many practitioners prefer the subcutaneous method of administering saline solutions. It is safer and more easily adopted, but probably not so effectual in cases of surgical shock.

The ordinary hypodermic needle may be employed, and to this is attached a piece of tubing. The needle is inserted into the loose subcutaneous tissue in the pectoral region, or at the lower part of the neck, or behind the elbow. A funnel may be attached to the tubing and the fluid poured in, or a douche-can containing the latter held above the part, or a

large syringe may be employed to inject the solution. From 1 to 3 pints may be thus administered; the part may be then gently massaged in order to diffuse the fluid in the subcutaneous tissue.

Saline solution can also be administered by rectal injections, but, of course, cannot prove anything so effectual as when given by the above methods.

Externally, sodium chloride combined with nitre and chloride of ammonium forms a refrigerating lotion.

Sodii sulphas—Sulphate of soda; Glauber's salt.

PREPARED by heating chloride of sodium with sulphuric acid. Hydrochloric acid is evolved, and sulphate of soda occurs as a residue.

DOSES.—As a purgative for cattle, lb. i. to lb. i.ss.; sheep, ʒii. to ʒiv.; well diluted with water, and given with treacle. As an *alterative* and *cholagogue* for horses, ʒii. twice daily, dissolved in the drinking-water; for dogs, gr. x. to ʒi.

ACTIONS.—Sulphate of soda administered in full doses to ruminants is a *saline purgative*, resembling Epsom salt, but slower in its action. Its purgative action on the horse is uncertain. It stimulates secretion of bile, and is thus a *direct cholagogue*.

Small doses are excreted by the kidneys for the most part unchanged, and produce a slight diuretic effect. If injected into the circulation, it does not produce toxic effects, such as those induced by the similar injection of Epsom salt.

MEDICINAL USES.—As a *saline purgative*, it is administered to cattle when we wish to act directly on the liver as well as on the intestines. In moderate doses, it is employed as a *laxative* and *cholagogue* in the horse in cases of congestion of the liver. It may be combined with sodium bicarbonate and sodium chloride, forming artificial Carlsbad salts. In canine practice sulphate of soda is not a suitable agent, as it tends to produce gastric irritation and vomition.

The phosphate of soda possesses a similar cholagogue action to the sulphate, but is seldom employed in veterinary practice. Sulphate of soda is recommended by Sir T. Lauder Brunton as the best *antidote to carbolic acid poisoning*. In

urgent cases he recommends that a solution of this agent should be injected directly under the skin, or even into the peritoneal cavity. The phenol unites with the sulphate, forming a non-poisonous compound, which is excreted in the urine.

Sodii nitris—Sodium nitrite.

DOSES.—Horses, grs. xx. to 5ss.; dogs, gr. i. to grs. ii. Repeated every four hours.

It is a vaso-dilator and antispasmodic, resembling amyl nitrite in its actions. It is used in cases of cardiac palpitation, and occasionally in asthma in canine practice, to ward off attacks of this affection.

Sodii hyposulphis—Hyposulphite of soda.

PREPARED by passing sulphurous acid gas into a solution of carbonate of soda with sulphur.

DOSES.—Horses and cattle, 3ss. to 3i.; dogs, grs. v. to grs. x. Administered twice daily, either in the form of powder or mixture.

ACTIONS.—Some authorities believe that hyposulphite of soda gives off sulphurous acid when administered internally. Experiments have demonstrated that this agent possesses marked antiseptic actions on the system.

MEDICINAL USES.—The results of the use of hyposulphite of soda as an internal antiseptic have not been satisfactory. It is recommended in the treatment of canine distemper, but other agents, such as quinine, are of greater value in this affection.

Liquor sodii ethylatis is prepared by dissolving metallic sodium in absolute alcohol.

ACTIONS.—It is an effective caustic in human surgery, but is seldom employed in veterinary practice.

Liquor sodæ chlorinatæ—Solution of chlorinated soda; also known as Labarraque's disinfecting fluid.

This agent is sometimes employed as a disinfectant and deodorant, but the derivatives of coal-tar are more serviceable and convenient for these purposes.

Sodii biboras—Borax (see Boric acid, p. 170).

Sodii bromidum (see Bromine, p. 159).

Sodii salicylas (see Salicylic acid, p. 368).

Sodii hypophosphis (see Phosphorus, p. 149).

III. AMMONIUM AND ITS MEDICINAL COMPOUNDS.

SOURCES.—The chloride of ammonium supplies directly or indirectly all the medicinal preparations and compounds of ammonium.

Liquor ammoniæ fortis—Strong solution of ammonia; spirits of hartshorn. This is water containing 32·5 per cent. of gaseous ammonia.

Liquor ammoniæ—Solution of ammonia. This contains only 10 per cent. of gaseous ammonia, and is selected for internal use.

DOSES.—Horses, ʒii. to ʒss.; cattle, ʒss. to ʒi.; sheep and pigs, ʒi.; dogs, ℥v. to ℥x. Repeated at intervals according to circumstances, and administered *well diluted* with mucilaginous fluids or oil, so as to avoid its irritating effect on the mouth and pharynx.

GENERAL ACTIONS.—Liquor ammoniæ fortis possesses the typical actions of ammonia. If applied to the skin it is a *stimulant*; and if prolonged, and evaporation prevented, it produces *vesication*. Unless well diluted, it causes violent irritation of the mouth, tongue, pharynx, and stomach. Inhaled by the nostrils, it produces reflex stimulation of the vaso-motor system, contraction of the bloodvessels, and a rise of blood-pressure, thus being a general stimulant. If administered internally, it is a powerful general stimulant, acting on the heart, the cerebrum, the nerve-centres, and the spinal cord; but its action in this respect is transient. It is quickly absorbed, and is believed to diminish the power of coagulation in the blood.

In *toxic* doses it is an *irritant* to the stomach, and, after primary stimulation of the nervous system, it causes paralysis of the nerve-centres and spinal cord.

Mistakes have occurred by administering the strong solution of ammonia instead of the milder preparations.

Suitable antidotes are dilute acetic acid, vinegar, oil, and a free allowance of demulcents and diluents.

The irritating effects of this agent on the tongue and buccal membrane are best treated by keeping the animal on fluid diet, and applying mouth-washes containing dilute acetic acid, borax, and honey.

MEDICINAL USES.—The strong solution of ammonia is not used internally. The weaker solution is employed as a general stimulant in cases of narcotic poisoning. In *tympanites* it neutralises the gases present, acts as an *antacid*, and stimulates the stomach and intestines to healthy action. In ordinary cases of *spasmodic colic* the solution of ammonia well diluted often gives relief.

In canine practice, the fumes of the strong solution of ammonia are sometimes employed as an inhalation in cases of shock, or in narcotic poisoning.

Externally, the strong solution of ammonia is largely used as a component of stimulating liniments and as a mild counter-irritant. For these purposes, 1 part each of strong solution of ammonia, oil of turpentine, and water are mixed with 10 parts of linseed-oil. Another useful liniment is prepared by mixing 1 ounce of camphor, 4 ounces of rectified spirit, 2 ounces of solution of ammonia, and a pint of olive-oil. Strong applications of ammonia should not be applied as counter-irritants, in consequence of their tendency to blemish the skin.

A weak solution of ammonia relieves the irritation produced by the bites and stings of insects.

Ammonii carbonas—Carbonate of ammonia. This is a mixture of ammonium hydrogen carbonate and ammonium carbamate.

PREPARED by subliming a mixture of chloride of ammonium and carbonate of calcium.

DOSES.—Horses, $\bar{\text{ss}}$. to $\bar{\text{ss}}$.; cattle, $\bar{\text{ss}}$. to $\bar{\text{ss}}$.; sheep and pigs, grs. xv. to grs. xxx. Dogs, grs. iii. to grs. viii. Administered in the form of bolus or pill, or dissolved in mucilaginous solution, and repeated at intervals according to circumstances.

ACTIONS.—Carbonate of ammonia, although not so active as the solution of ammonia, is more permanent in its effects.

It is a powerful *general stimulant* in full doses, acting on the cardiac and respiratory systems, and also on the glands of the body, increasing the secretions from the latter. It stimulates the entire nervous system and promotes intestinal secretion, also bronchial secretion. Besides these actions, it is *antacid*, *antitympanitic*, and *carminative*.

MEDICINAL USES.—As a *stimulant*, carbonate of ammonia is a very useful agent in the treatment of respiratory affections when stimulants are indicated. It can be administered in the form of bolus, repeated at intervals, and is far safer than alcohol for this purpose, as in affections of this nature medicines in the form of drenches should be avoided as much as possible.

In the treatment of colic, depending on impaction of the large intestine, full doses of carbonate of ammonia, combined with *nux vomica*, are recommended by Mr. H. Caulton Reeks, F.R.C.V.S. (see p. 459).

Instead of prescribing sedatives in this condition, he advises the administration of 2 ounces of carbonate of ammonia and 1 ounce of powdered *nux vomica*, divided into four balls, and given at one dose. These doses are intended for a full-sized horse, and can be lessened in the case of an animal of smaller size.

The carbonate of ammonia, without the *nux vomica*, is repeated at intervals according to the progress of the case. By means of this treatment nerve power is restored to the intestinal walls and normal peristaltic action is promoted. At the same time, the agents administered act as general stimulants, also as antispasmodics.

In the treatment of ordinary spasmodic colic a dose of carbonate of ammonia is the only medicinal agent required in many instances.

In the gastric affections of cattle the carbonate of ammonia is largely used, in combination with *nux vomica*. It relieves tympany, restores nerve power to the gastric walls, and acts as a general stimulant.

In canine practice carbonate of ammonia is sometimes prescribed as a stimulant emetic, combined with *ippecacuanha*

wine. It is indicated in cases of bronchitis, where it is desirable to remove viscid mucus from the bronchial tubes, the expiratory efforts induced by the act of vomition causing expulsion of the material which is obstructing the respiratory passages.

As a *stimulating expectorant*, promoting bronchial secretion and expectoration, it is prescribed in the secondary stages of bronchitis.

Spiritus ammoniæ aromaticus — Aromatic spirits of ammonia; sal volatile.

PREPARED by dissolving 4 ounces of carbonate of ammonia and 8 ounces of strong solution of ammonia in 6 pints of rectified spirit and 3 pints of water, and flavouring with oil of nutmeg and oil of lemon.

DOSES.—Horses and cattle, ʒii. to ʒiv. ; dogs, ʒss. to ʒi.

ACTIONS AND USES.—As this preparation contains about $\frac{1}{2}$ ounce of carbonate of ammonia and 1 ounce of strong solution of ammonia to the pint, it is not of sufficient strength for horses and cattle unless given in large doses. To prevent irritation of the mouth, these doses must be well diluted, and, as the preparation is expensive as compared with the carbonate of ammonia, the latter is often preferred for the larger animals.

In canine practice the aromatic spirits of ammonia is employed as a general stimulant, also as a carminative and antacid. In combination with vegetable bitters, such as calumba or gentian, it forms a useful alkaline stomachic mixture in cases of dyspepsia.

Liquor ammonii acetatis—Solution of ammonium acetate; Minderus spirit.

PREPARED by dissolving carbonate of ammonium in distilled water, and neutralising with acetic acid. It contains about 1 ounce of the carbonate of ammonium to the pint of solution.

DOSES.—Horses, ʒiv. to ʒvi. ; dogs, ʒii. to ʒss. , repeated at intervals.

A concentrated solution, five times the strength of the above, occurs in the British Pharmacopœia, 1885, under the heading of *Liq. ammonii acetatis fortior*.

ACTIONS AND USES.—Acetate of ammonium is a *diaphoretic*, a *febrifuge*, and a *mild diuretic*. Its diaphoretic action is not well marked in animals, and in consequence of the small amount of ammonia it contains, its action as a stimulant is very slight. In combination with sweet spirit of nitre it constitutes an old form of febrifuge mixture, but one that has proved very useful in the early stages of respiratory affections.

The concentrated solution of acetate of ammonium is a more convenient preparation for horses than the ordinary solution, as the latter requires to be given in large doses in order to produce any effects.

Ammonii chloridum — Chloride of ammonium; sal ammoniac.

PREPARED by neutralising ammoniacal gas liquor with hydrochloric acid.

DOSES.—Horses, $\bar{\text{ss}}$.; cattle, $\bar{\text{ss}}$.; sheep and pigs, grs. xx. to $\bar{\text{ss}}$.; dogs, grs. iii. to grs. x.

ACTIONS AND USES.—Chloride of ammonium is an *expectorant* and a *cholagogue*. In toxic doses it is a gastrointestinal irritant. It is occasionally prescribed as an expectorant in the secondary stages of bronchitis, also in cases of chronic bronchitis.

Externally, in combination with nitrate of potassium, sodium chloride, and water, it forms a refrigerating lotion.

IV. CALCIUM AND ITS MEDICINAL SALTS.

Calcium oxide—Lime; quicklime; calx.

PREPARED from limestone or other forms of calcium carbonate.

Calcii hydras—Slaked lime—is prepared by slaking lime with water.

Liquor calcis, or **Aqua calcis**—Lime-water.

PREPARED by adding 2 ounces of slaked lime (washed free of chlorides) to a gallon of distilled water, and decanting the clear solution. It should contain about $\frac{1}{2}$ grain of lime to the fluid ounce.

ACTIONS AND USES.—Externally, lime is a *caustic* and *irritant*. It is largely employed in the form of solution as a cleansing and deodorising agent to the walls of buildings, etc.

Lime-water possesses *sedative*, *antacid*, and *astringent* actions. It is frequently added to milk, in order to prevent the formation of masses of casein in the stomachs of animals fed exclusively on this diet, such as calves and young dogs. The addition of about one-fourth of lime-water proves very beneficial in such cases.

In irritable conditions of the stomach, met with in dogs and characterised by excessive acidity and frequent vomiting, lime-water added to the milk diet gives good results.

The saccharated solution of lime is preferable in some cases, as it is fourteen times stronger than ordinary lime-water; and less being required, the milk need not be diluted to the same extent. It is prepared by mixing 1 ounce of slaked lime and 2 ounces of sugar in a pint of water, and decanting the clear solution. The addition of the sugar to water greatly increases its solvent power for lime, so that each fluid ounce contains about 8 grains of lime.

The dose for calves is about 2 ounces, and for dogs about 20 to 60 minims.

Linimentum calcis, also known as carron-oil, is prepared by mixing equal parts of lime-water and raw linseed-oil.

It is employed as a local astringent and desiccant in cases of scalds and burns.

Creta præparata—Prepared chalk—is prepared from the native carbonate of calcium.

DOSES.—Horses, $\mathfrak{z}\text{i.}$ to $\mathfrak{z}\text{ii.}$; cattle, $\mathfrak{z}\text{ii.}$ to $\mathfrak{z}\text{iv.}$; sheep and pigs, $\mathfrak{z}\text{ii.}$ to $\mathfrak{z}\text{iv.}$; dogs, grs. viii. to $\mathfrak{z}\text{ss.}$

ACTIONS AND USES.—Chalk is *antacid* and *astringent*. Being more slowly absorbed than lime-water, it is capable of exerting local actions on the intestinal canal. It is prescribed in cases of diarrhœa, and is believed to produce therapeutical effects by lessening the irritability of the intestinal mucous membrane, and leaving a film of carbonate of calcium thereon.

In severe cases of diarrhœa, it is combined with astringents and carminatives or with chlorodyne, and may be

administered in solutions of starch. The employment of astringents in such cases requires caution (see p. 471).

Chalk is an antidote to oxalic acid and the mineral acids.

Calcii chloridum—Chloride of calcium.

PREPARED by adding hydrochloric acid to chalk.

ACTIONS AND USES.—The chloride of calcium increases the coagulability of the blood, and has been found useful in human surgery as a hæmostatic agent. It is given for this purpose, both internally and by enema, for several days prior to an operation, in doses of 30 grains.

As a local hæmostatic, a solution of 30 grains to the ounce of water is recommended in cases of bleeding after tooth-extraction, such as may occur in patients with hæmophilia. It has also been found useful in cases of intestinal hæmorrhage.

Calcium lactate has been used for similar purposes.

Calx chlorinata—Chlorinated lime ; bleaching-powder.

PREPARED by exposing slaked lime to the action of chlorine gas.

ACTIONS AND USES.—It is a disinfectant and deodoriser, and may be employed for disinfecting stables, cowsheds, etc. ; but other agents are preferred for these purposes.

Calcii sulphas—Sulphate of lime ; calcined gypsum ; plaster of Paris.

This agent is employed in making plaster of Paris bandages for use in the treatment of fractures.

Calcii phosphas—Phosphate of lime—is prepared from bone-ash by the action of hydrochloric acid. It is occasionally prescribed in the treatment of anæmia and rickets in young animals.

Calcii hypophosphis (see Phosphorus, p. 149).

Calx sulphurata (see Sulphur, p. 161).

V. MAGNESIUM AND ITS MEDICINAL SALTS.

Magnesii carbonas ponderosus—Heavy carbonate of magnesium.

Magnesii carbonas levis—Light carbonate of magnesium.

These are prepared by mixing solutions of sulphate of magnesia and carbonate of soda.

The heavy carbonate is formed by boiling the solution, and only differs from the light carbonate in its physical properties. Fluid magnesia contains 10 grains of carbonate of magnesia to the fluid ounce.

Magnesia ponderosa—Heavy magnesium oxide; heavy calcined magnesia—is prepared by exposing heavy magnesium carbonate to a dull red heat.

Magnesia levis—Light magnesium oxide; light calcined magnesia—is prepared from light magnesium carbonate by ignition at a dull red heat.

The carbonates and the oxides of magnesia have similar actions—viz., *antacid* and *laxative*.

DOSES.—Foals and calves, aged from three to four months, ʒss. to ʒii.; dogs, grs. v. to ʒss.

ACTIONS AND USES.—Magnesia is chiefly prescribed as an *antacid* and *laxative* for young foals, calves, and for dogs in cases of dyspepsia.

A mixture of the carbonate with the sulphate of magnesium is useful in canine practice, forming what is known as *Mistura alba*. This is prepared by combining 10 grains of magnesium carbonate and 1 drachm of magnesium sulphate in 1 ounce of peppermint-water.

Magnesii sulphas—Sulphate of magnesium; Epsom salt.

PREPARED from the native sulphate or from carbonate of magnesium by solution in sulphuric acid, and then purifying.

DOSES.—As a *purgative*: for adult cattle, lb. i.; calves, two or three months, ʒiii. to ʒiv.; sheep and pigs, ʒiv.; dogs, ʒii. to ʒiv. As an *alterative* and *febrifuge*: horses, ʒii. to ʒiii., repeated twice daily, and administered either in the food or in the drinking water; dogs, gr. x. to gr. xx.

ACTIONS.—In ruminants a full dose acts as a *hydragogue cathartic*, causing in from twelve to fifteen hours free fluid evacuations. It produces this effect by causing a large secretion of fluid from the intestinal mucous membrane; this distends the intestine and induces purgation. The drug does not to any extent stimulate peristaltic movements directly.

It is believed to limit absorption from the intestine. Only a small portion is absorbed, and this is excreted by the kidneys. A certain amount of fluid and saline matters is removed from the blood, the result being that a compensating amount is withdrawn from the tissues, and thirst is induced. Solutions containing less than 5 per cent. of the drug may fail to induce purgation.

The sulphate of magnesium has no direct cholagogue action, but by clearing away the bile present in the intestine it indirectly produces an increase in the biliary secretion.

The purgative action of the sulphate of magnesium on the horse is uncertain. Large amounts of this agent may produce no cathartic effect in some instances, while in others purgation may ensue. Small doses frequently repeated produce a gentle aperient effect. On the dog a full dose is more likely to induce vomiting than purgation, but small doses act as laxatives.

The sulphate of magnesium, if injected into the circulation, is an active poison, causing paralysis of the vital nerve-centres. In this respect it differs from sodium sulphate (see p. 105).

MEDICINAL USES—As a *purgative*, the sulphate of magnesium is largely employed for ruminants, and if used with discretion is a very valuable agent for this purpose. It should be administered in a liberal supply of warm water and treacle, the addition of a carminative such as powdered ginger being of advantage to prevent griping.

The formula we find most effectual for cattle is as follows: 1 pound of sulphate of magnesium and 1 ounce of powdered ginger, dissolved in 4 pints of warm water and 2 pounds of treacle.

A very erroneous practice prevails among the owners of cattle—viz., that of administering large and repeated doses of sulphate of magnesium in cases of obstinate constipation. In such instances a paralysed condition of the gastric and intestinal walls is present, depending usually on some affection of the stomach (see p. 440). The large doses of this agent administered, instead of producing catharsis, cause

marked depression of the system, a tympanitic condition of the rumen, and, if the case happens to be one of gastritis, this condition becomes aggravated.

The rational treatment of affections in which a paralysed condition of the stomach and intestines is present is to prescribe nerve tonics and general stimulants, together with full doses of oleaginous aperients—*e.g.*, carbonate of ammonia, nux vomica, and raw linseed-oil.

Sodium chloride is sometimes prescribed along with sulphate of magnesium in the proportion of $\frac{1}{2}$ pound of each agent, and the combination is said to produce more active cathartic effects than the magnesium salt administered alone.

For the horse, the sulphate of magnesium, although not prescribed as an active cathartic, is very useful as a mild purgative and as a laxative. It is readily taken in the food or in the drinking water, and to some horses 4-ounce doses can be administered in this manner, and repeated until mild purgation results. In others, however, large amounts may be taken and only a laxative effect produced.

In all febrile conditions the sulphate of magnesium is largely prescribed. It lowers abnormal temperature, stimulates the functions of the bowels and kidneys, and assists in the removal of waste products from the system. For these purposes it is combined with nitrate of potassium, and can be dissolved in the patient's drinking water twice daily.

As an *alterative*, it is prescribed in unhealthy conditions of the skin and in cutaneous affections.

In canine practice it is not employed as a purgative, as its nauseous taste is liable to induce vomiting. Small doses, in the form of *mistura alba* (see p. 114), are prescribed as alteratives and laxatives.

Sulphate of magnesium is an efficient *antidote* in poisoning by salts of lead. It converts the latter into insoluble sulphates, and assists in their removal from the system.

Barii Chloridum—Chloride of Barium.

PREPARED by dissolving the native carbonate in hydrochloric acid.

DOSE.—As an intravenous injection for the horse, grs. viii.

to grs. xx., dissolved in $2\frac{1}{2}$ drachms of water. As a drench, $\bar{5}i.ss.$ to $\bar{5}iii.$ in 2 pints of water; smaller doses—viz., $\bar{5}i.$ to $\bar{5}ii$ —are safer.

ANTIDOTES.—Sulphate of magnesium or sulphate of sodium.

ACTIONS.—If administered by intravenous injection, the chloride of barium acts with great rapidity, within one to two minutes causing energetic contraction of the muscular coat of the intestine throughout its entire length, the result being copious evacuations of the intestinal contents. This action may continue for five or six hours. At the same time, stimulation of the muscular tissue of the bladder and blood-vessels occurs.

The heart is at first stimulated and blood-pressure raised; but the secondary effect is to depress the former and lower the latter.

Toxic doses produce salivation, muscular tremors, sweating, violent straining, and finally spasm of the heart, and general paralysis of the nervous system.

MEDICINAL USES.—Chloride of barium has been employed by Continental practitioners in the treatment of colic depending on impaction of the intestine. Although favourable reports have been given with reference to the use of this drug, the violence of its action, the difficulty in controlling it, the risks of rupture of the intestine, or of fatal cardiac depression, should induce us to prefer agents which experience has proved to be safer, while quite as effectual.

Dieckerhoff recommends that the dose be divided as follows: Half the amount at the first injection, and two quarter doses at intervals of eight to ten minutes. If administered in the form of a drench, the chloride of barium is not so certain in its effects.

Chloride of barium has also been recommended in the treatment of impaction of the rumen and acute tympanites in cattle.

The dose advised is 15 grammes for cows, and 16 to 18 grammes for oxen and bulls. These doses are divided into 2 parts, and may be given in draught, electuary, or bolus, in combination with sodium chloride; an interval of three or four hours being allowed between each dose.

CHAPTER III

GROUP II.—THE METALS

ALUMINIUM.

THE most important salt of this metal is **alumen** or **alum**.

Potassium alum—Potash alum.

PREPARED by combining aluminium sulphate with potassium sulphate.

Ammonium alum—Ammonia alum.

PREPARED by combining aluminium sulphate with ammonium sulphate.

ACTIONS AND USES.—*Internally*, alum is an *astringent*, and in toxic doses an *irritant*.

Externally, it possesses *astringent* and *styptic* actions.

It is seldom prescribed for internal use, but is occasionally employed, in combination with glycerine, as a mouth-wash in cases of aphtha and ulcerations of the buccal membrane. It is often administered to cows by farmers in order to arrest the secretion of milk when it is desired to stall-feed the animals, the dose being from 2 to 4 drachms twice daily.

Externally, a saturated solution of alum proves useful as a *styptic* in cases of emergency. It is also a popular application to the shoulders of horses that tend to get galled by the collar.

An injection of 1 drachm of alum to the pint of water has been found useful as an injection in cases of leucorrhœa.

Alum is an *antidote* to lead-poisoning, as it precipitates the lead salts in the intestine.

PLUMBUM (LEAD) AND ITS MEDICINAL SALTS.

GENERAL ACTIONS OF LEAD SALTS.—*Externally*, the salts of lead are *astringent*, *sedative*, and *desiccant*. They precipitate albumin, cause contraction of capillaries, and depress the peripheral terminations of sensory nerves. In the latter action they differ from most of the other metals.

Internally, they act as astringents, diminishing secretion, contracting bloodvessels, and retarding normal peristaltic movements of the intestines. They are absorbed as albuminates, and are readily taken up by the tissues. They are slowly excreted by the bowels, kidneys, liver, and skin.

TOXIC EFFECTS.—The tendency of lead to accumulate in the tissues gives rise to a condition known as *plumbism*. This occurs in cases where the agent has been taken for some time. The effects produced are due to the irritant action of the lead salt on the voluntary and involuntary muscles and on the nervous system.

The symptoms vary in different animals: in some there are evidences of gastro-intestinal disturbance; in others the nervous system is involved, resulting in a cramped condition of the muscles of the limbs, and, finally, paralysis.

In cattle, brain symptoms, evidenced by a staggering gait and impaired vision, may occur.

In horses, convulsions, partial paralysis, and marked respiratory distress have been observed.

Colic and constipation, which are frequent symptoms of lead-poisoning in human beings, are seldom met with in animals in connection with this agent.

The diagnosis of lead-poisoning is difficult, as the symptoms may be ascribed to other causes. A blue line may be observed around the gums at the base of the incisor teeth. This is due to a deposition of the sulphide of lead beneath the mucous membrane, which, shining through the latter, appears of a blue colour.

Lead-poisoning may occur from contamination of the food or water with this agent. Cases are recorded in which toxic symptoms have been produced by animals licking fresh paint containing lead.

Other sources of lead-poisoning which have been reported are the contamination of pastures by bullet-spray from rifle-butts and smelting-furnaces. The latter cause a deposit of soluble lead salts on the pastures.

Soft waters and those rich in nitrites, nitrates, chlorides, and nitrogenous matters may acquire toxic properties by passing through lead pipes, especially if the latter be new.

Hard waters—*i.e.*, those containing carbonates, sulphates, or phosphates—are less liable to contamination, as insoluble precipitates are formed in the interior of the pipes, and the water cannot come into contact with the metallic lead.

ANTIDOTES TO LEAD SALTS.—The administration of the iodide of potassium three times daily, each dose being followed in about two hours by sulphate of magnesia and dilute sulphuric acid, gives the best results.

The iodide of potassium eliminates the lead from the tissues into the blood ; it is then removed by the intestinal canal. Here the sulphate of magnesia renders the lead insoluble, and by its aperient action hastens the removal of the latter from the body.

Plumbi oxidum—Oxide of lead ; litharge.

PREPARED by roasting lead in a current of air.

ACTIONS AND USES.—It is not prescribed internally.

Externally, it is *desiccant* and *astringent*, and its chief use is in the preparation of lead plaster or diachylon plaster. This is sometimes employed for bringing the edges of small wounds together.

Plumbi carbonas—Carbonate of lead ; white lead.

PREPARED by exposing lead to the vapour of acetic acid and simultaneously to air charged with carbonic acid.

ACTIONS AND USES.—It is not used internally.

Externally, it is *astringent* and *sedative*. It is employed in the treatment of cracked heels, mud fever, etc., in the form of ointment, for which the following is a useful and most effectual formula :

Plumbi carb., $\mathfrak{z}\text{i}$. ; plumbi acet., $\mathfrak{z}\text{i}$. ; pulv. camphoræ, $\mathfrak{z}\text{ss}$. ; ol. eucalypti, $\mathfrak{z}\text{ss}$. ; lanolin, $\mathfrak{z}\text{vi}$. Mix.

Plumbi acetas—Acetate of lead ; sugar of lead.

PREPARED by heating oxide of lead in acetic acid and water.

DOSES.—Horses and cattle, $\bar{\text{ss}}$. to $\bar{\text{si}}$.; dogs, gr. i. to grs. iv.

INCOMPATIBLES.—All vegetable astringents, alkalies, preparations of opium, iodide of potassium.

ACTIONS AND USES.—*Internally*, the acetate of lead is an *astringent* and *styptic*.

Externally, it is an *astringent* and *local sedative*.

As an astringent, it is prescribed in obstinate cases of diarrhœa and dysentery, usually in combination with opium. As a styptic or hæmostatic, it is prescribed in cases of hæmorrhage from the stomach or intestines, or from any of the internal organs.

Externally, lotions containing acetate of lead are useful as cooling and sedative applications to strained tendons, bruises, and superficial inflammation. The familiar *white lotion* so largely employed as an astringent in veterinary practice is composed of 1 part acetate of lead and $\frac{3}{4}$ part sulphate of zinc, dissolved in 20 to 30 parts of water. Although chemically incompatible, the combination proves a very useful one.

Liquor plumbi subacetatis fortis—Goulard's extract.

PREPARED by boiling together acetate of lead, oxide of lead, and water.

Liquor plumbi subacetatis dilutus—Diluted solution of lead subacetate; Goulard water.

PREPARED by mixing Goulard's extract, 2 drachms; alcohol, 2 drachms; water, 20 ounces.

ACTIONS AND USES.—It is an astringent and local sedative resembling the acetate of lead in these respects. As an external application, it is preferred to the latter, being more soluble and not liable to crystallise. Diluted with 6 parts of olive-oil, it forms a useful liniment in cases of grease and mud fever in horses. It is also employed as a local application in cases of irritable conditions of the skin.

In canine practice, liniments containing lead are *not safe*, as the animals may lick the parts, and toxic symptoms may result; for this reason preparations of zinc are preferred.

Dilute solutions of Goulard's extract are sometimes employed as collyria in cases of catarrhal inflammations of the eye, but are contra-indicated if any abrasion of the cornea be present, as an opacity due to the formation of albuminate of lead may result. Diluted with an equal part of methylated spirit and with 8 to 10 parts of water, it forms a useful lotion in cases of strained tendons, etc.

The glycerinum plumbi subacetatis, which is prepared in a similar manner to Goulard's extract, but contains glycerine as a solvent instead of water, is a useful application for eczema in the horse.

Plumbi iodidum—Iodide of lead.

PREPARED by mixing solutions of nitrate of lead and iodide of potassium, and drying the precipitate; is occasionally employed in the form of an ointment (1 to 7) as an absorbent application to enlarged joints, glandular swellings, etc.

ZINC AND ITS MEDICINAL SALTS.

INCOMPATIBLES OF ZINC SALTS.—Alkalies and their carbonates, lime-water, acetate of lead, nitrate of silver, astringent vegetable preparations.

GENERAL ACTIONS OF ZINC SALTS.—The salts of zinc resemble those of lead, silver, and copper in their actions. In large doses they produce *irritant* effects and depress the nerve-centres. In medicinal doses they act as astringents and nerve tonics.

Zinci oxidum—Oxide of zinc.

PREPARED by heating the carbonate of zinc.

ACTIONS AND USES.—*Internally*, it is an astringent and a nerve tonic, but is seldom employed for this purpose.

Externally, it is an astringent and desiccant, and is largely employed as a dressing in cases of eczema, either as a dusting-powder or as an ointment. Combined with iodoform it gives excellent results as a dressing in cases of fissured heels arising from grease and mud fever in horses. It also forms a useful application in cases of canker of the ear in dogs.

One part of zinc oxide with 6 or 8 parts of lanolin forms a

mild astringent ointment, which is largely employed in canine practice in the treatment of eczematous affections of the skin.

Zinci carbonas—Carbonate of zinc ; calamine.

Has similar actions and uses to the oxide of zinc.

Zinci sulphas—Sulphate of zinc ; white vitriol.

PREPARED by the action of dilute sulphuric acid on granulated zinc.

DOSES.—As an *astringent* and *tonic*: Horses, ʒss. to ʒi.; dogs, gr. i. to grs. iii. As an *emetic* for dogs, grs. x. to grs. xxx., dissolved in 2 ounces of warm water.

ACTIONS AND USES.—Given internally, sulphate of zinc is an *astringent* and *nerve tonic*. It forms a safe and effectual *emetic* in those animals capable of the act of vomiting.

Externally, it is a stimulant and astringent.

As a nerve tonic and astringent, it is seldom prescribed, other agents proving more satisfactory.

As an *emetic*, from 10 to 30 grains dissolved in 2 ounces of warm water act promptly in the dog, producing little prostration or nausea, as it belongs to the class of direct emetics (see p. 50).

Externally, as an astringent injection, it is employed to check discharges from the genito-urinary passages, such as leucorrhœa. A saturated solution is sometimes used in the treatment of sinuses and fistulæ.

In catarrhal conditions of the conjunctiva, after the acute stage has passed, a solution containing 2 grains of sulphate of zinc to the ounce of distilled water, applied with an eye-dropper twice daily, gives good results.

A combination of sulphate of zinc with acetate of lead and water, as already stated, forms the familiar *white lotion*. As these substances are chemically incompatible, the result is that the acetate of zinc is formed in solution and is the active constituent in this lotion; the sulphate of lead being insoluble, is thrown down as a white precipitate.

Zinci chloridum—Chloride of zinc.

PREPARED by the action of hydrochloric acid on granulated zinc.

ACTIONS AND USES.—It is a powerful *caustic*, producing

this effect by coagulating albumin and abstracting water from the tissues. Judiciously employed, it proves useful in the treatment of unhealthy ulcers, and also in cases of foot-rot in sheep. It was a favourite application in the treatment of sinuses and fistulæ, but these are now treated far more satisfactorily by surgical methods.

Chloride of zinc is not used internally, and in a toxic dose it is an *irritant* and *corrosive* poison. It possesses marked antiseptic properties, a 10 per cent. solution rendering septic wounds aseptic and preventing putrefaction. Strong solutions are sometimes applied to prevent the extension of malignant growths.

Burnett's Disinfecting Fluid contains 25 grains of chloride of zinc to each fluid drachm.

CUPRUM (COPPER) AND ITS MEDICINAL SALTS.

The general actions of the soluble salts of copper resemble those of zinc and silver. *Toxic* doses are *irritants*, producing colic and diarrhœa, while in cases of chronic poisoning nervous symptoms appear, with muscular weakness and trembling.

Cases of copper poisoning may result from contaminated pastures in the neighbourhood of copper-smelting works, but the most common source is the use of copper vessels in cooking food for cattle, pigs, and dogs. This is more likely to occur if the food is allowed to remain in the copper vessel, exposed to air and moisture, and especially if acid and fatty matters be present.

Suitable *antidotes* are: Demulcents, white of egg, barley-water, gruel, etc.; and if pain be a prominent symptom, the hypodermic injection of morphine will be indicated.

The only important salt of copper in veterinary practice is the sulphate.

Cupri sulphas—Sulphate of copper; cupric sulphate; blue-stone; blue vitriol.

PREPARED by heating copper with sulphuric acid.

INCOMPATIBLES.—Alkalies and their carbonates, lime-water, iodides, and most vegetable astringents.

ACTIONS AND USES.—*Internally*, it is *astringent* and *tonic*, and a prompt *emetic* in those animals capable of vomiting.

Externally, it is *stimulant*, *astringent*, and *escharotic*.

As a nerve tonic and astringent, it is occasionally prescribed for the horse, in doses of a drachm, administered in the form of bolus ; but other agents are preferable.

As a direct emetic, it is sometimes employed in canine practice in cases of narcotic poisoning, from 6 to 10 grains being dissolved in water for this purpose.

Sulphate of copper is an antidote to phosphorus poisoning, and for this purpose is administered in small doses frequently repeated. The copper becoming deposited on the phosphorus, renders the latter inert.

Externally, sulphate of copper is extensively employed as a stimulant, astringent, and caustic, in suppressing exuberant granulations and in the treatment of ulcers, etc. It may be applied in the form of a solution or in powder. Combined with the sulphates of iron and zinc, it forms a useful dressing in cases of canker of the horse's foot.

In cases of foot-rot in sheep, sulphate of copper, in combination with lard and tar, is a serviceable application.

As an astringent lotion in the treatment of granular conjunctivitis in the dog, 1 or 2 grains to the ounce of distilled water is recommended.

Combined with acetate of lead, sulphate of zinc, and camphor-water, it forms a useful astringent lotion in cases of foetid grease and cracked heels in horses.

ARGENTUM (SILVER).

The salt of silver used in veterinary practice is the nitrate.

Argenti nitras—Nitrate of silver ; lunar caustic.

PREPARED by dissolving silver in dilute nitric acid.

Argenti nitras induratus—Toughened caustic.

Silver nitrates, 19 parts ; potassium nitrate, 1 part. Mix by fusion.

ACTIONS AND USES.—*Internally*, in medicinal doses it is a *nerve tonic* and *astringent*, but is seldom employed for these

purposes in veterinary practice. In *toxic* doses it is an *irritant* poison, and the suitable antidote is common salt, which converts it into the insoluble chloride. Demulcents should also be given freely.

Externally, nitrate of silver is caustic and astringent. As its action is confined to the part to which it is applied, it is largely employed for the purpose of controlling exuberant granulations in wounds. In such cases it coagulates albumin and forms a protective covering, under which healing proceeds; this covering tends to contract, and thus a slight pressure is exerted on the part. It constricts dilated vessels and lessens secretion from mucous membranes. When applied to a raw surface a white film is produced, due to the formation of chloride of silver; this soon becomes of a dark colour.

In cases of pharyngeal or laryngeal ulceration in dogs, a solution of nitrate of silver, containing from 8 to 10 grains to the ounce, is applied by means of a camel's-hair brush.

In cases of ophthalmia, a lotion containing from $\frac{1}{2}$ grain to 2 grains to the ounce is useful, when the acute inflammation has subsided.

In opacity of the cornea, a solution containing 4 grains to the ounce is applied with a camel's-hair brush, and often succeeds in removing this blemish.

In cases of canker of the ear in dogs, when ulceration of the lining membrane is present, a strong solution of nitrate of silver, carefully applied, gives good results.

If the solid nitrate of silver be employed in the treatment of ulcers of the pharynx, etc., care should be taken that the agent is not swallowed by the patient. Should this accident occur, the antidotes mentioned above should be administered.

Argentum colloïdale—Colloid silver; collargol.

This is a soluble metallic silver preparation possessing antiseptic actions. It has been used in the treatment of purpura hæmorrhagica, in doses of $7\frac{1}{2}$ grains, administered by intravenous injection.

Protargol—Silver protein—possesses deep penetrating powers, and is said not to precipitate albumen. It has been

advised in conjunctival affections in the form of a 5 to 10 per cent. solution.

Argyrol contains 30 per cent. of silver combined with a protein. Solutions of 5 to 50 per cent. are used in ophthalmic practice, and are said to be painless when instilled into the eyes.

FERRUM (IRON) AND ITS MEDICINAL SALTS.

GENERAL ACTIONS.—Some salts of iron, such as the perchloride, are strongly *astringent*, and in toxic doses are irritant and corrosive. Others are mild astringents and are prescribed as hæmatinics; these are represented by the oxides and the carbonate.

All preparations of iron possess *hæmatinic* and *tonic* actions. The precise action of iron on the blood is not yet determined. Some authorities state that little, if any, iron is absorbed into the blood, and that the beneficial effects produced by its administration depend on an improvement in the process of digestion and assimilation. Others believe that the *ozone*-producing power of the red corpuscles is increased and the hæmoglobin is restored to a normal condition, also that all iron salts are converted into the chloride by the acid of the stomach. The unabsorbed portions are excreted chiefly by the intestines, giving a characteristic black appearance to the *fæces*. This is due to the formation of the sulphide and tannate of iron, which results from the action of the ingesta and the sulphuretted hydrogen which is present.

INCOMPATIBLES OF PREPARATIONS OF IRON.—Alkalies and their carbonates, lime-water, and all preparations containing tannin.

Ferri carbonas saccharatus—Saccharated carbonate of iron.

PREPARED by adding a solution of ammonium carbonate to one of sulphate of iron, and rubbing the precipitate with sugar.

DOSE.—Horses, ʒiij. to ʒiv. ; dogs, grs. v. to grs. xv. in the form of pills twice a day.

ACTIONS AND USES.—This is a mild preparation of iron,

possessing but a slight astringent action on the intestines, and not tending to cause gastric irritation or to derange digestion. Hence it is prescribed in canine practice in cases of anæmia, debility, and as a general tonic in convalescence from debilitating affections. It may be combined with quinine and nux vomica for these purposes.

Pilula ferri—Blaud's pill.

PREPARED with exsiccated ferrous sulphate and exsiccated sodium carbonate.

DOSE for dogs, grs. v. to grs. xv.

MEDICINAL USES.—This forms a useful tonic and hæmatinic pill for dogs in cases of debility, anæmia, etc. In combination with quinine, nux vomica, and aloin, it forms a tonic laxative, which is prescribed in cases of constipation depending on loss of intestinal nerve-power, the following formula proving a useful one: Blaud's pill, grs. iii.; quinine sulphate, gr. $\frac{1}{2}$; extract of nux vomica, gr. $\frac{1}{10}$; and aloin, gr. $\frac{1}{8}$.

Liquor ferri dialysatus (B. P., 1885)—Solution of dialysed iron.

This is a preparation formed by the mixture of ferri chloride and solution of ammonia, which forms ferric hydrate; this is dissolved in a strong solution of ferric chloride and washed with water in a dialyser. This process removes acidulous matter and renders the product less styptic in taste.

DOSES.—Horses, ʒss. to ʒi.; dogs, ℥x. to ℥xx.

MEDICINAL USES.—This preparation is useful as a tonic and hæmatinic in cases where the stronger preparations of iron would be inadmissible, such as in irritable conditions of the stomach. A drawback to its employment is that it is compatible with few drugs, and does not bear dilution with ordinary water without depositing the oxide. Hence it should be mixed with 2 parts of glycerine when dispensing. It is stated by some authorities to be superior to the moist peroxide of iron as an antidote to arsenic.

Ferri peroxidum humidum—Ferri peroxidum hydratum; sesquioxide of iron; moist ferric oxide, with about 86 per cent. of uncombined water.

PREPARED by mixing 3 parts of liquor ferri perchloridi and 1 of sodium carbonate, and diluting with water.

MEDICINAL USES.—This is the most effectual antidote for arsenical poisoning. It converts the arsenious acid into an insoluble compound, and should be given freshly prepared in hot water and in large amounts at frequent intervals.

In cases of emergency the tincture of perchloride of iron may be precipitated with carbonate of sodium, and filtered through a handkerchief; or a solution of ammonia may be employed instead of carbonate of sodium.

Ferri sulphas—Ferrous sulphate; sulphate of iron; green vitriol; copperas.

PREPARED by the interaction of diluted sulphuric acid and iron.

DOSES.—Horses, \mathfrak{ss} . to \mathfrak{ss} ii.; cattle, \mathfrak{ss} i. to \mathfrak{ss} iv.; sheep, grs. x. to grs. xxx.; dogs, gr. i. to grs. v. Given in the form of bolus or powder twice daily.

Ferri sulphas exsiccatus—Dried sulphate of iron—is prepared by heating the ordinary sulphate of iron to 212° F. Two and a half parts of the former are equal to 4 parts of the latter, hence the doses are computed accordingly. The dried sulphate is a convenient form of the drug for dispensing.

MEDICINAL USES.—The sulphate of iron is extensively prescribed in equine practice as a *hæmatinic* and *general tonic*. It is contra-indicated in cases where an irritable condition of the stomach is present. In consequence of its astringent action, it tends to produce constipation, and hence should be combined with saline laxatives, such as the sulphate of magnesia or sulphate of soda.

As a general tonic, it is usually prescribed with nuxvomica, quinine, or a vegetable bitter, such as gentian. Although technically incompatible with all vegetable drugs which contain tannin, the combination is often useful. In solution with vegetable astringents, it forms a black-coloured mixture, due to the production of tannate of iron.

We often find that the milder preparations of iron give better results in cases of debility, such as occur after attacks

of influenza and respiratory affections. Sulphate of iron is prescribed in cases of diabetes insipidus, along with the iodide of potassium. These agents are incompatible, as iodide of iron is formed, which, nevertheless, proves useful. In combination with other drugs, the sulphate of iron is employed as a vermicide.

The milder forms of iron give better results in canine practice than the sulphate.

Externally, it is disinfectant and antiseptic, but is seldom employed for these purposes.

Liquor ferri perchloridi fortis—Strong solution of perchloride of iron.

PREPARED by boiling iron in hydrochloric acid and water, and adding a little nitric acid to produce the higher chloride. From the above are prepared :

Liquor ferri perchloridi—Medicinal solution of perchloride of iron. This is formed by adding 1 part of the strong solution to 3 parts of water.

DOSES.—Horses and cattle, ʒss. to ʒi.; dogs, ℥v. to ℥xv. Given properly diluted with water.

Tinctura ferri perchloridi—Tincture of perchloride of iron ; tincture of steel. This is formed by mixing 1 part of the strong solution with 1 part of spirit and 2 parts of water.

DOSES.—Same as those of the medicinal solution of the perchloride.

MEDICINAL USES.—The strong solution is not used internally.

Externally, it is a powerful *styptic*, but possesses a very corrosive action on the tissues, hence other styptics are preferred. The medicinal solution and the tincture are prescribed as hæmatinics and general tonics. Their use requires discrimination, as in some cases they cause irritation of the stomach and interference with digestion.

Small doses properly diluted should be prescribed, and it is of advantage to combine a suitable amount of glycerine with the mixture.

In cases of purpura hæmorrhagica, the tincture is employed in combination with chlorate of potash or oil of turpentine.

In canine practice, the milder preparations of iron give better results.

The medicinal solution of the perchloride, diluted with 8 parts of water, is sometimes employed in cases of *post-partum* hæmorrhage, being slowly injected into the uterus by means of a long tube.

The *tinctura ferri perchloridi* has been found useful as a local application in the treatment of ringworm.

Ferri iodidum—Iodide of iron—is a combination of iron and iodine, which is useful in cases of diabetes insipidus, nasal gleet, and in affections where a *tonic* and *alterative* are indicated.

It is best prescribed in the form of syrup of ferrous iodide, the dose of which for the horse is ʒi. , and for the dog ʒss. to ʒi.

Ferri arsenas—Arsenate of iron—is a combination of iron and arsenic, which is occasionally prescribed in the treatment of chronic skin affections as a tonic and alterative.

DOSES.—Horses, grs. v. to grs. x.; dogs, gr. $\frac{1}{16}$ to gr. $\frac{1}{4}$.

Ferri phosphas—Phosphate of iron—is a combination of ferrous phosphate and ferric phosphate. It combines the actions of iron and phosphorus, and is prescribed chiefly in canine practice as a tonic in cases characterised by debility, and in convalescence from distemper. It is also useful in cases of rickets.

In combination with quinine and strychnine, it forms an admirable tonic for dogs; and this is most conveniently prescribed in the form of *syrupus ferri phosphatis cum quinina et strychnina*, which is a modified form of *Easton's Syrup*. This contains in each fluid drachm 1 grain of ferrous phosphate, $\frac{1}{5}$ grain of quinine sulphate, and $\frac{1}{32}$ grain of strychnine; and the dose for dogs is from ʒxx. to ʒi.

The *syrupus ferri phosphatis compositus* is a modified form of Parrish's Syrup, and contains $\frac{1}{2}$ grain of phosphate of iron, $\frac{1}{5}$ grain of phosphate of calcium, with small quantities of phosphates of potassium and sodium in each fluid drachm.

It is prescribed for dogs suffering from debility of any

origin, and during convalescence from acute diseases, the dose varying from ʒss. to ʒii.

Ferri et ammonii citras—Iron and ammonium citrate.

This preparation is a useful hæmatinic in canine practice, being almost devoid of astringency, and not tending to cause gastric irritation or constipation. It can be prescribed in cases where other preparations of iron would not be tolerated.

The dose for dogs is from grs. v. to grs. x., given in solution with syrup of orange to disguise the taste.

Ferri et quininae citras—Iron and quinine citrate—a preparation of citrate of iron and quinine, is employed as a tonic in canine practice, when it is desirable to combine these agents.

DOSE.—For dogs, grs. v. to grs. x., in solution with syrup of orange.

Liquor ferri acetatis—Solution of ferric acetate.

This preparation is a diuretic as well as a hæmatinic, and may be administered in cases of chronic renal disease in doses of 5 to 15 minims for the dog. It is compatible with potassium acetate and potassium iodide.

HYDRARGYRUM (MERCURY).

All salts and preparations of mercury are derived either directly or indirectly from the metal itself.

GENERAL ACTIONS.—Mercurous salts are slowly absorbed, and only possess a slight local action. Mercuric salts are soluble; they are quickly absorbed, and act as irritant poisons. When combined with albumin they form insoluble albuminates.

The solution of mercuric nitrate is an active caustic, the biniodide is a counter-irritant, and the perchloride is an antiseptic, and in toxic doses an irritant corrosive poison. The subchloride or calomel is a cathartic. If applied to the skin in the form of ointments or dressings for any length of time, mercurials become absorbed and produce definite effects, known as *mercurialism* or *hydrargyrism*. This also occurs from the prolonged administration of the drug. It is

characterised by salivation, tenderness of the mouth and gums, impaired appetite, dyspepsia, diarrhœa, muscular tremors, emaciation, and in some cases the appearance of eczematous eruptions on the skin, and of osseous affections.

The suitable *antidotes* are the administration of potassium iodide, which withdraws the mercury in a soluble form from the tissues into the blood, from whence it is excreted by various channels, but chiefly by the kidneys. Mouth-washes containing chlorate of potash are also indicated. Mercury quickly enters the tissues from the blood, and is slowly excreted from the former. The major portion is found in the liver. It is removed from the system by all the secretions, but especially by the kidneys. It exerts an obscure action on the tissues, which is termed an *alterative* influence.

Dogs are more susceptible to the action of mercurials than horses or cattle, hence great care is essential in prescribing these agents internally, or in applying dressings containing them.

Pilula hydrargyri—Blue pill.

Two parts (by weight) of mercury, mixed with 3 parts of confection of roses and 1 of powdered liquorice-root. This is prescribed in canine practice as an indirect *cholagogue* and cathartic, in combination with the compound pill of colocynth and hyoscyamus, the dose being from grs. ii. to grs. iv.

Hydrargyrum cum creta—Mercury with chalk; gray powder.

PREPARED by triturating together 1 part of mercury with 3 parts of prepared chalk.

MEDICINAL USES.—As a *laxative*, *antacid*, and *alterative*, it is prescribed in cases of bilious indigestion and diarrhœa occurring in young foals and calves, and for this purpose is given in doses of grs. v. to grs. xv., repeated twice daily.

It is a useful preparation of mercury in canine practice, being mild and non-irritating in its action.

It is specially indicated in dyspepsia depending on hepatic irregularities, which occurs in young dogs, and in small doses frequently repeated it gives good results in some cases of jaundice.

The dose varies from gr. ss. to gr. iv., according to the size of the patients, and it is best administered in the form of pills or tabloids.

Unguentum hydrargyri—Blue ointment ; mercurial ointment.

PREPARED by mixing 1 part of mercury with 2 parts of lard and suet.

USES.—As a stimulating absorbent application and as a parasiticide, it is now seldom employed. If applied to the skin in sufficient amount and with friction, the mercury gains entrance to the system, and produces its specific effects thereon. This is neither desirable nor necessary in veterinary practice.

Linimentum hydrargyri—Mercurial liniment.

Oleatum hydrargyri—Oleate of mercury.

These preparations are diffusible, penetrating, absorbent agents, occasionally employed in the treatment of ringworm and in cases of enlarged and indurated glands.

Hydrargyri suboxidum—Black oxide of mercury.

This is the active constituent in the following lotion—viz. :

Lotio hydrargyri nigra—Black wash.

PREPARED by mixing 30 grains of calomel, $\frac{1}{2}$ ounce of glycerine, $1\frac{1}{4}$ ounces mucilage of tragacanth, and lime-water to 10 ounces.

This lotion is occasionally prescribed as a stimulant and astringent to ulcers and unhealthy surfaces.

Hydrargyri oxidum rubrum—Red mercuric oxide ; red precipitate.

This preparation of mercury is used as a stimulant and astringent application in cases of chronic grease, cracked heels, etc., and for such purposes is employed in the form of an ointment—viz., the unguentum hydrargyri oxidi rubri, known as red precipitate ointment. This is prepared with 1 part of red precipitate in 10 parts of yellow paraffin ointment.

Hydrargyri oxidum flavum—Yellow mercuric oxide.

This is the active constituent in the following lotion :

Lotio hydrargyri flava—Yellow wash.

PREPARED by mixing 20 grains of corrosive sublimate

with 10 ounces of lime-water. The yellow oxide of mercury is precipitated from the mixture. This lotion is more active than that already mentioned as black wash, and its uses are similar.

Unguentum hydrargyri oxidi flavi—Yellow mercuric oxide ointment.

PREPARED with 1 part of yellow mercuric oxide and 49 parts of yellow soft paraffin (1 in 50).

The chief use of this ointment is in the treatment of certain affections of the eye and eyelids.

Diluted with an equal amount of vaseline, it is applied in cases of eczematous affections of the eyelids, corneal ulcerations, and chronic conjunctivitis. A small quantity placed between the eyelids is useful in cases of ophthalmia, as it prevents the tendency of the eyelashes to become glued to each other by the drying of the discharge.

Hydrargyri subchloridum—Subchloride of mercury; calomel; mercurous chloride.

PREPARED by heating a mixture of mercurous sulphate and sodium chloride. The calomel rises in vapour and is then condensed and washed.

DOSES.—As a *cathartic* and *cholagogue*: Horses, $\bar{3}$ i. to $\bar{3}$ ii.; cattle, $\bar{3}$ i. to $\bar{3}$ ii.; dogs, grs. ii. to grs. v., usually combined with other purgatives.

INCOMPATIBLES.—Bromides and iodides, nitro-hydrochloric acid, hydrocyanic acid, chlorides of the alkalies, solution of lime, iodoform.

ACTIONS AND USES.—Calomel, in consequence of its insoluble character, is mild in its action as compared with other preparations of mercury. Given in a sufficient dose, it acts as a *purgative* in all animals, producing this effect by stimulating the intestinal glands and irritating the mucous membrane.

It is also an *indirect cholagogue*—i.e., it exerts a special purgative action on the duodenum and ileum—and thus carries away bile and prevents its reabsorption. At the same time, it is believed to stimulate the liver reflexly and to clear out the bile-ducts.

Calomel possesses a diuretic action, which is more marked when it is combined with salines or resinous agents. If administered in repeated doses, it produces the physiological effects of mercury which have already been described.

In the horse an excessive dose may produce colicky pains and superpurgation. Some authorities state that this animal is not so susceptible to the toxic effects of the drug as cattle.

Dogs are very susceptible to the action of calomel, and great discretion is necessary in computing suitable doses, especially for the smaller breeds.

It is believed by some that calomel possesses a disinfectant action on the intestinal canal, in addition to its action of evacuating the intestinal contents and eliminating noxious by-products of digestion and bile.

Externally it is *desiccant*, *stimulant*, and *astringent*.

As a *cathartic* and *cholagogue*, calomel is prescribed for the horse in cases where full purgative effects are desired, such as acute indigestion, lymphangitis, brain affections, azoturia, etc. It is also useful in cases of torpid condition of the liver and in hepatic congestion. For these purposes it is usually combined with aloes, and administered in the form of bolus.

In the treatment of the various forms of indigestion in dogs, calomel is a useful cathartic agent, as it is not likely to be rejected by the stomach. It can be administered in the form of pill or tabloid, and may be combined with the compound pill of colocynth and hyoscyamus.

In the treatment of jaundice, whether depending on disorders of the liver or on obscure causes, small repeated doses of calomel often give good results. It should be administered in doses of $\frac{1}{4}$ grain every four hours, until the bowels are acted on, and some improvement in the symptoms is observed. In the case of young dogs and in the small breeds, the hydrargyrum cum creta is preferred for this purpose.

Externally, calomel in the form of ointment (1 to 8) is sometimes employed to allay the severe itching of certain

skin affections, such as eczema. Combined with iodoform, oxide of zinc, and boric acid, it forms an excellent application for the treatment of that affection known as 'thrush' in the horse's foot. The incompatibility of calomel and iodoform does not affect the value of the combination.

Hydrargyri perchloridum — Mercuric chloride; perchloride of mercury; corrosive sublimate.

PREPARED by heating a mixture of mercuric sulphate, sodium chloride, and black oxide of manganese.

INCOMPATIBLES.—Alkalies and their carbonates, iodide of potassium, acetate of lead, albumin.

ACTIONS.—Perchloride of mercury, being very soluble and containing twice as much chlorine as calomel, possesses marked toxic properties. It is an *irritant corrosive* poison, causing gastro-enteritis and general collapse. Administered in smaller doses, it produces mercurialism.

The suitable *antidotes* are: Albumin, in the form of eggs, which forms an insoluble albuminate; milk and flour may also be administered for a similar purpose.

Externally, corrosive sublimate precipitates albumin, and is an active caustic and escharotic. In the proportion of 1 part to 1,000 parts of water it forms an efficient *antiseptic*, capable of destroying bacilli and their spores.

MEDICINAL USES.—It is seldom prescribed for internal use. Experiments have demonstrated that it directly increases the secretion of bile: hence it is occasionally employed in the treatment of jaundice in the dog in doses of gr. $\frac{1}{16}$ to gr. $\frac{1}{8}$ (see p. 507).

For this purpose the **Liquor hydrargyri perchloridi**, which contains 1 grain in 2 ounces of distilled water, is the most convenient form for prescribing this agent, the dose for the dog being 1 to 2 fluid drachms.

The chief use of corrosive sublimate is as an efficient *antiseptic* in the treatment of wounds and for general surgical work. For these purposes it is employed in the form of lotions, the strength being 1 part to 1,000 parts of water.

For convenience, accuracy, and portability, tablets containing 8.75 grains are prepared by chemists. One of these,

dissolved in 20 ounces of water, forms a solution of the strength indicated.

Perchloride of mercury possesses certain drawbacks as an antiseptic agent. First, in the case of extensive wounds, or in those already septic, it will be necessary to use a stronger solution than that indicated above. In such instances the irritating effect of the agent and the risk of its absorption must be remembered. Again, the perchloride has a corrosive action on steel and plated instruments. In the presence of albumin it forms an inert and insoluble compound, but this can be obviated by adding 5 parts of tartaric acid to each part of the perchloride, and so preventing the formation of an albuminate.

In the prevention of contagious abortion in cattle, a solution of the perchloride (1 to 1,000) is applied to the external genital organs and surrounding parts.

Perchloride of mercury forms one of the constituents of Dean's injection for the treatment of bog-spavin (see p. 158).

In former times corrosive sublimate, in the form of powder and strong solutions, was employed in the treatment of quittor and allied affections, but modern surgical methods have superseded the use of such agents, and give more satisfactory results.

In the treatment of open joint, the following lotion is recommended by some authorities: Perchloride of mercury, $\frac{1}{2}$ drachm; tincture of myrrh, 4 ounces; water, $\frac{1}{2}$ ounce.

Various forms of surgical dressings contain corrosive sublimate as an antiseptic agent, such as sublimate gauze (1 to 1,000) and sublimate wool (1 to 400).

Sal alembroth — Mercuric ammonium chloride — is a mixture of 1 part of perchloride of mercury with 2 parts of ammonium chloride.

It is a powerful antiseptic. It does not combine with albumin so quickly as corrosive sublimate, and hence is less irritating. It is chiefly used in the preparation of surgical dressings. Alembroth gauze contains 1 per cent.; alembroth wool contains 2 per cent. These are tinted with aniline blue, and, as the colour is bleached by purulent

discharges, an indication is given when surgical dressings require to be changed.

Mercuro-zinc cyanide is a combination of perchloride of mercury with zinc and potassium cyanide. It is a reliable non-irritating antiseptic, and its chief use is in the preparation of a special gauze, which is employed as a surgical dressing.

Hydrargyrum ammoniatum — Ammoniated mercury; ammonio-chloride of mercury; white precipitate.

PREPARED by precipitating a solution of perchloride of mercury with a diluted solution of ammonia. It is not used internally.

Unguentum hydrargyri ammoniati — White precipitate ointment.

Ammoniated mercury, 1; white paraffin ointment, 9.

USES.—White precipitate ointment is sometimes employed in the treatment of parasitic skin diseases in the dog. It proves an effectual remedy in cases of eczema after the acute stage has passed, and is especially useful when the affection attacks the flexor surfaces of joints, also in chronic cases. In consequence of the danger of absorption and of the patient licking the parts, great discretion is necessary in its application, and other agents are preferred.

A safer ointment is prepared by mixing 1 part of white precipitate ointment, 3 parts of oxide of zinc ointment, and 2 parts of glycerine.

In the horse white precipitate ointment gives good results in the treatment of grease and cracked heels, and also in cases of those affections of the skin known as *mallenders* and *sallenders*.

Hydrargyri iodidum rubrum — Biniodide of mercury; red iodide of mercury.

PREPARED by mixing solutions of perchloride of mercury and potassium iodide.

ACTIONS AND USES.—Red iodide of mercury in medicinal doses is an *alterative* and *antiseptic*; in toxic doses it is an irritant poison. It is prescribed in cases of lymphangitis in the horse after the acute stage has passed, in doses of 5 grains

three times daily, and is said to be as effectual as potassium iodide, while it is far cheaper. Also in cases of scirrhus cord, and in tumours of the shoulder depending on the presence of *discomyces*.

A convenient solution is prepared by dissolving 1 drachm of the biniodide in 12 ounces of water by means of the addition of an equal amount of potassium iodide. Of this mixture 1 ounce may be given three times daily in the food.

This preparation has been found very useful in the treatment of the above affections and allied conditions by Mr. F. G. Edwards, F.R.C.V.S., Chester, and he states that it can be given for a long period of time without any risk of the toxic effects of mercury occurring.

In the treatment of cellulitis and septic arthritis in foals, he advises the administration of 1 grain of biniodide of mercury three times daily. For actinomycosis in cattle, 10 grains of the biniodide with an equal amount of potassium iodide, given three times daily, proves as effectual as the latter agent, while it is far cheaper. The combination is termed mercuric potassium iodide. In a solution of 1 to 1,000 of water it forms an efficient antiseptic for surgical purposes.

Externally, the red iodide of mercury is an active *counter-irritant* and *absorbent*, which is extensively employed in the form of ointment in the treatment of diseased joints and the various forms of exostoses. If applied of sufficient strength, it penetrates deeply and acts as a *suppurant*. A safe blistering ointment is prepared with 1 part of red iodide of mercury and 8 parts of lanolin. When severe counter-irritation is indicated, it is usual to combine equal parts of the red iodide and cantharides.

In the treatment of capped hock, a useful absorbent lotion is prepared by dissolving 1 drachm of the red iodide with a sufficiency of the iodide of potassium to render the former soluble in 12 ounces of water; this is applied daily until the part gets tender and scaly, then discontinued for a time and reapplied. The red iodide is also an efficient antiseptic, and for this purpose it enters into the composition of antiseptic soaps, and tablets for preparing solutions.

In cases of ulcerated heels in the horse, when the ulcers are deep as the result of large portions of skin sloughing out, the biniodide of mercury ointment acts as an excellent stimulant and promoter of cicatrisation. Mr. H. Gray, Kensington, finds that the application relieves all pain in a few hours, and he also advises its use in the treatment of ulcers on the shoulders or withers.

The green iodide of mercury (mercurous iodide), in the form of ointment (1 to 8) freshly prepared, has been found useful in the treatment of mallenders and sallenders.

Liquor arsenii et hydrargyri iodidi—Donovan's solution.

This combines the alterative actions of arsenic and mercury, and contains 1 per cent. of the iodide of arsenic and the red iodide of mercury. It is recommended in the treatment of chronic scaly affections of the skin, the dose for horses being $\mathfrak{z}\text{i.}$ to $\mathfrak{z}\text{ii.}$, and for dogs $\mathfrak{M}\text{v.}$ to $\mathfrak{M}\text{xx.}$

Unguentum hydrargyri nitratis—Citrine ointment.

This is prepared by mixing a hot solution of mercury, nitric acid, lard, and olive-oil together. When mixed with 4 parts of soft paraffin, it forms the dilute citrine ointment, which is the preparation usually employed.

USES.—In canine practice it is occasionally used in the treatment of eczema, especially in the stage of desquamation and in chronic cases; it is of advantage to combine it with an equal amount of a 5 per cent. ointment of cyllin or of lysol. The danger of mercurial poisoning must be remembered. In irritable discharging conditions of the eyelids, with chronic inflammation and ulceration of the hair follicles, a very dilute citrine ointment, carefully applied, is productive of good results. In these cases it should be diluted 1 to 7.

The **Liquor hydrargyri nitratis acidus**—acid solution of nitrate of mercury—is a strong caustic seldom employed in veterinary practice.

ANTIMONIUM (ANTIMONY).

The only preparation of antimony which is of any interest in veterinary practice is the antimonium tartaratum, or tartar emetic. The liquor antimonii chloridi, or butter of antimony,

is a powerful escharotic which is now seldom employed, but was formerly used as a caustic application in cases of canker of the foot in the horse and foot-rot in sheep.

Antimonium tartaratum—Tartarated antimony ; potassio-tartrate of antimony ; tartar emetic.

PREPARED by mixing oxide of antimony and acid tartrate of potassium with water, then boiling, evaporating, and crystallising.

ACTIONS.—Tartar emetic, in the form of powder, administered to horses and cattle internally, produces no appreciable effects. Experimental evidence shows that even large amounts do not exert any physiological action beyond causing a slight degree of nausea and a lowering of the blood-pressure. If administered in the form of solution, however, doses of from $\frac{1}{2}$ ounce to 2 ounces produce muscular spasms, colicky pains, and death in a variable period of time. One drachm given by intravenous injection produced sweating, purging, salivation, attempts at vomiting, and 2 drachms caused death in from one and a half to three hours, preceded by vertigo and paralysis.

In the dog it is a powerful emetic, 1 to 3 grains causing in from ten to fifteen minutes vomiting ; this action is prolonged, much nausea and depression resulting. At the same time, it acts as an expectorant, increasing the bronchial secretion and rendering it more fluid. It is both a direct and indirect emetic, producing this effect by its local action on the stomach, as well as by stimulating the vomiting centre in the medulla. In toxic doses it is an irritant poison, causing gastro-enteritis, purging, cardiac weakness, and paralysis.

The suitable *antidotes* are, tannic acid and substances containing tannin ; these form an insoluble compound with the toxic agent. Demulcents are also indicated, and stimulants if there are symptoms of collapse.

Externally, tartar emetic is a powerful irritant when applied to the skin ; it irritates the orifices of the sweat-glands and sebaceous follicles, and causes the formation of pustules, together with deep-seated painful inflammation of the part.

MEDICINAL USES.—Tartar emetic is believed by some

practitioners to exert an alterative action on the skin, and is sometimes prescribed, along with other agents, to improve the condition of horses, the usual doses being 1 to 2 drachms. It is doubtful whether such amounts produce any effect on the system, judging from experimental evidence. It is also employed as a vermicide, but proof is wanting as to its efficacy in this respect. The violence of its action externally precludes its use as a counter-irritant.

In canine practice it is not used in this form, as other agents are far safer as expectorants or emetics.

Vinum antimoniale—Antimonial wine—is prepared by dissolving 40 grains of tartar emetic in 1 ounce of distilled water, and adding sufficient sherry to form 20 ounces.

It is sometimes prescribed in canine practice, in the early stages of bronchitis, as an expectorant, in doses of from 10 to 20 minims (see p. 604).

ARSENIUM (ARSENIC).

Acidum arseniosum—Arsenious acid; white arsenic.

SOURCE.—Obtained by roasting arsenical ores.

DOSES.—Horses and cattle, grs. v. to grs. viii.; sheep, gr. ss. to grs. ii.; dogs, gr. $\frac{1}{10}$ to $\frac{1}{20}$, repeated twice daily and combined with other agents in the form of powders administered in the food.

Liquor arsenicalis—Liquor potassæ arsenitis; Fowler's solution.

INCOMPATIBLES.—Liquor strychninæ.

DOSES.—Horses and cattle, ʒss. to ʒi.; dogs, ℥ii. to ℥viii. This is a mixture of arsenious acid and carbonate of potash in water, coloured with compound tincture of lavender. It contains about $4\frac{1}{2}$ grains of arsenic to each fluid ounce.

ACTIONS.—In medicinal doses arsenic is a *tonic* and *alterative*. It stimulates the gastric nerves, improves digestion, and increases the appetite. It diminishes oxidation, increases the formation of fat, and is eliminated from the system chiefly by the kidneys, also by the liver and the skin. It exerts a specific action on the skin, and is believed to

favour desquamation of the superficial layer of this structure by a process of stimulation.

Administered in gradually increasing doses, a tolerance of the drug is acquired, and a knowledge of this fact is of importance from a therapeutical point of view.

Externally, arsenic in the form of arsenious acid is a powerful *caustic* and *escharotic*. In dilute solutions it is a parasiticide.

TOXIC ACTIONS.—Arsenic is a *corrosive irritant* poison, producing in all animals gastro-enteritis. The rapidity of its action depends on the solubility of the agent, the presence of food in the stomach, and on the susceptibility of the animal to the effects of the drug.

In the horse the symptoms observed were violent purging, severe colicky pains, tenesmus, staggering gait, cold extremities, a weak, irregular, thready pulse, death occurring in a variable period, with symptoms of coma or with tetanic spasms. The toxic dose for the horse is liable to great variation. In some instances 1-drachm doses have produced no effects, while in others smaller amounts have caused nausea, colic, and purging. One case is recorded in which 30 grains given in a solution of carbonate of potash caused death in four days. If the stomach be empty, the toxic actions may be manifested with great rapidity, and death may occur within an hour.

The nervous system is specially acted on by arsenic, the sensibility and reflex irritability of the spinal cord being first diminished, and the motor nerves and the muscles depressed; finally, general paralysis occurs.

In some cases of arsenical poisoning the usual symptoms of gastro-enteritis may be absent, a state of profound coma resulting instead. In such instances the action of the poison is exerted chiefly on the nervous system.

Cases of chronic arsenical poisoning are on record which have occurred from contamination of the pastures in the neighbourhood of copper-smelting works. The symptoms observed were swollen joints, emaciation, indigestion, thirst, and distressed breathing on moderate exercise.

Cattle are less susceptible to the toxic actions of arsenic than horses. They take larger amounts, and in consequence of the physiological peculiarities of their digestive system absorption is slow. From 4 to 8 drachms are stated to produce poisonous effects.

In *sheep* many cases of arsenical poisoning are recorded from the careless use of sheep-dips containing this agent.

Experiments have demonstrated that arsenic is not absorbed through the healthy skin, and that the source of the poisoning was contamination of the pastures by allowing the sheep to wander thereon after being dipped, the drippings from the fleece falling on the grass, and thus the drug gained entrance to the system. The symptoms observed were: Dulness, nausea, frothing at the mouth, colicky pains, accelerated respirations, and in some instances death occurred rather suddenly. The precautions to be taken in using arsenical sheep-dips are to avoid too large a proportion of arsenic in the preparation of the dip, to keep the animals in an empty yard for a proper interval after dipping, and not to return them to the pastures until their fleeces are dry.

The dog is very susceptible to the actions of arsenic, the toxic dose being from 2 to 5 grains. The symptoms produced are nausea, vomiting, abdominal pain, purging with dark-coloured evacuations, quick, wiry pulse, soon becoming thready, and death preceded by convulsions. Moderate doses frequently repeated for a long period are said to sometimes prove more toxic than larger doses given at longer intervals.

The post-mortem appearances of arsenical poisoning vary according to the severity of the case. In the horse the villous portion of the stomach is intensely inflamed, and may be eroded if the poison be taken in the form of powder. The small and large intestines are acutely inflamed in patches. In cases where the drug has been continued for some time fatty degeneration of the liver and other organs is observed, and the carcase usually resists decomposition to a large extent.

A source of arsenical poisoning in horses is the continued

administration of the drug by attendants with the idea of improving the condition of the animals. In the dog, cases occur from the careless use of rat-poisons and vermin-killers containing arsenic.

The *suitable antidotes* to arsenical poisoning are: in the dog, if treatment can be adopted immediately, the use of emetics, such as mustard or zinc sulphate, with full amounts of fluids, in order to get rid of the poison from the stomach. The best *chemical antidote* for arsenic is the moist ferric hydroxide. This can be prepared in various ways. In cases of emergency a solution of ammonia may be added to the tincture of perchloride of iron or to the solution of ferric chloride; or carbonate of soda may be added to the above preparations of iron, and the resulting precipitate filtered through a handkerchief. The antidote thus prepared should be given in large amounts in hot water and at intervals of ten minutes.

Another preparation recommended is 3 parts of solution of perchloride of iron in 17 parts of water, and adding to this, when the antidote is required, 1 part of calcined magnesia in 17 parts of water. For the dog $\frac{1}{2}$ ounce should be administered every five or ten minutes; for the horse, 8 or 10 ounces.

These antidotes should be given freshly prepared, and in amounts equivalent to at least twelve times the probable quantity of the poison that has been taken. They convert the arsenic into an inert insoluble substance.

Dialysed iron is also an efficient antidote, while, in the absence of iron preparations, hydrated magnesia, obtained by precipitating a solution of sulphate of magnesia with caustic potash, may be employed.

As mechanical antidotes, oils, demulcents, milk, white of egg, lime-water, etc., should be administered in large amounts.

Hypodermic injections of morphine are indicated to retard absorption and relieve pain.

In chronic arsenical poisoning, oleaginous laxatives, tonics, and occasional diuretics should be prescribed.

MEDICINAL USES.—In cases where diarrhœa occurs shortly after food has been taken, this depending on imperfect digestion in the stomach, small doses of liquor arsenicalis, administered *before* feeding, give good results. This beneficial effect is due to the action of arsenic as a gastric tonic.

In nervous affections, such as chorea and epilepsy in dogs, arsenic is prescribed in combination with other nerve tonics.

In spasmodic asthma in dogs, and in cases of that affection known as 'broken wind' in horses, arsenic is a valuable palliative remedy, attention being directed at the same time to dietetic treatment. It is also useful in cases of chronic cough, and its effects in connection with such affections must be ascribed to its actions as a general nerve tonic, acting on the nerves of the respiratory system as well as on the gastric nerves.

In cases of *anæmia* and *general debility*, it is prescribed in combination with preparations of iron.

As an *alterative*, with a special action on the skin, it is employed in various affections of this structure, such as psoriasis, eczema, etc. It should not be prescribed in the acute stage of eczema, and is contra-indicated in cases accompanied by gastric irritability. The best form for administration is the liquor arsenicalis. This should be given either along with the food or immediately after feeding, so as to avoid any tendency to irritation of the gastric mucosa. The exception to this has already been mentioned.

As the liquor arsenicalis is incompatible with acid mixtures, *e.g.*, with liquor strychninæ, the liquor arsenici hydrochloricus, which is of similar strength, can be substituted, when such a combination is desirable. When arsenic is continued in medicinal doses for a long period, certain symptoms may appear which are important to recognise, as their advent is an indication to diminish the amount prescribed, but not to suspend the drug suddenly. These consist of a slight œdematous condition of the eyelids, a slight degree

of conjunctivitis, and gastric irritation, the latter being evidenced by indigestion, diarrhœa, and thirst.

In prescribing arsenic, it is always advisable to commence with small doses, and to gradually increase these as the system becomes accustomed to the effects of the drug. This precaution is necessary in consequence of individual idiosyncrasies, and also as it is necessary in many instances to push the administration of the agent before the beneficial effects are produced. Arsenic has been found useful in the treatment of periodic ophthalmia, but must be administered for a long time.

Externally, the chief use of arsenic is in the preparation of sheep-dips for the treatment of scabies in sheep. The following is a safe dip: Take 2 pounds of arsenious acid, 2 pounds of carbonate of potash, 2 pounds of sublimed sulphur, and 4 pounds of soft soap; dissolve in 10 gallons of boiling water, and add cold water to make 100 gallons. This will be sufficient to dip about 100 sheep, and the following precautions should be attended to—viz.: The sheep should be kept in the dip about a minute, with the head carefully kept away from the fluid. The animal is then placed on a sparred apparatus over another receptacle, and the wool squeezed as dry as possible with a scraper, especial care being taken not to allow the animal on pasture immediately afterwards.

In former times arsenic was employed as a caustic and escharotic in cases of quittor, but the modern surgical methods of treatment by means of the knife and curette have superseded such antiquated and barbarous measures. Arsenic in the form of paste carefully applied is found useful in the treatment of inoperable tumours in the horse, and in the removal of warts having a sessile base. For this purpose a paste composed of arsenic. alb. $\mathfrak{z}\text{i.}$, tinct. cantharides $\mathfrak{z}\text{i.}$, and 6 drachms each of Venice turpentine, olive-oil and yellow wax, has been advised.

In the treatment of infective sarcomata or contagious venereal tumours in the vagina of the bitch (especially frequent in the bull bitch), Mr. H. Gray, Kensington, recom-

mends the following treatment: First apply a solution of cocaine by means of swabs soaked therein, so as to anæsthetise the part; then curette, and rub the raw surface with a crystal of cupri sulph. a few times to remove diseased tissue. Dress with liq. arsenicalis, and administer gr. $\frac{1}{20}$ of arsenic twice daily until the parts have healed. Examine at periods of two weeks. This method does not cause constriction of the vagina, such as may occur after excision of the growths.

PHOSPHORUS.

Although phosphorus is a non-metallic element, we have thought it advisable to insert in it this chapter, in consequence of a similarity in its actions to those of arsenic. It is derived from bones by the action of sulphuric acid thereon, calcium phosphate being formed, from which phosphorus is obtained by evaporation, then mixing with charcoal and distilling. Phosphorus itself is not prescribed in veterinary practice, but the hypophosphites of sodium and calcium are important *alteratives* and *tonics*.

ACTIONS.—Phosphorus possesses alterative actions similar to those of arsenic. It diminishes combustion of fats, increases tissue change in the body, and augments the transformation of proteids into fats. It has special actions as a nerve tonic, and is a stimulant to the central nervous system. It has also a special effect in promoting the development of bone.

TOXIC ACTIONS.—Phosphorus is an *irritant corrosive poison*, causing in the dog gastro-enteritis, vomiting, intense thirst, and purging. The vomited substance may be of a dark-green colour, with the odour of garlic, and sometimes appears luminous in the dark. In some cases there may be vomiting of blood, a weak pulse, and convulsions, followed by coma. It is usually a comparatively slow poison, death not occurring before two or three days, but occasionally cardiac paralysis results and death occurs quickly. Partial recovery may ensue; this is followed by symptoms of hepatic disease, such as jaundice, with tenderness over the region of the liver and

enlargement of that organ. Smaller doses, repeated for a few days, cause fatty degeneration of various organs and tissues.

Phosphorus is more toxic if taken in a finely-divided condition, and the chief source of poisoning by it in the dog is from the accidental ingestion of rat-pastes or vermin-killers, which frequently contain this agent.

ANTIDOTES.—Sulphate of copper should be administered in a dose of 3 grains dissolved in water every five minutes until vomiting is produced. By this means a portion of the poison is got rid of, and copper is deposited on what remains, rendering it inert. It should be continued in 1-grain doses every quarter of an hour, and combined with morphine if rejected by the stomach. Oil of turpentine is another antidote; this combines with the phosphorus, and, although rendering it soluble, a non-poisonous substance is formed. Some authorities state that only the French oil of turpentine is effectual for this purpose. This is obtained from the *Pinus maritima*. Thirty minims should be administered every half an hour. A purgative consisting of Epsom salt is also advised. *All fats, oils, milk, eggs, etc.*, should be avoided, as they render the agent soluble, but mucilaginous drinks may be freely given.

USES.—The hypophosphites of calcium and sodium, which possess the medicinal actions of phosphorus without the irritating effects of the latter, are prescribed as alteratives and nerve tonics. They are specially indicated in cases of debility and anæmia in young animals, and in convalescence from acute diseases. They are also useful in cases of rickets in young dogs.

In the resolution stage of catarrhal pneumonia, the hypophosphites tend to cause the absorption of the exudate, by assisting the process of fatty degeneration therein. For this purpose they are preferably administered in the form of an *emulsion with cod-liver oil*.

The doses of calcium hypophosphite and sodium hypophosphite for the horse are from ʒi. to ʒii., for the dog grs. iii. to grs. x. The most convenient form for administration in

canine practice is the *syrupus calcii et sodii hypophosphitum*, each fluid drachm of which contains 2 grains of each hypophosphite. Dose for the dog, $\bar{5}\text{ii}$. to $\bar{5}\text{ss}$. Another convenient preparation is the *syrupus hypophosphitum compositus*; this contains strychnine, hypophosphorous acid, and the hypophosphites of calcium, manganese and potassium, quinine hypophosphite with iron hypophosphite. The dose of this preparation for the dog is $\bar{5}\text{ss}$. to $\bar{5}\text{ii}$.

Sodium phosphate acts as a moderate cholagogue, and in full doses a mild saline purgative. It is seldom used in veterinary practice.

BISMUTHUM (BISMUTH).

The chief salts of bismuth employed in veterinary practice are the subnitrate and the carbonate.

Bismuthi subnitrates—Subnitrate of bismuth.

Bismuthi carbonas—Bismuth oxycarbonate; carbonate of bismuth.

DOSES of both the above: Horses, $\bar{5}\text{ss}$. to $\bar{5}\text{i}$.; dogs, grs. x. to grs. xxx.

Liquor bismuthi concentratus is composed of subnitrate of bismuth, citric acid, bicarbonate of soda, and water.

DOSE for the dog, ℥xv . to $\bar{5}\text{ss}$.

ACTIONS AND USES.—Bismuth is a *gastric* and *intestinal sedative* and also an *astringent*. It lessens the irritability of the gastric nerves, and also acts in a mechanical manner by shielding the mucous membrane with a protective covering. Large doses, if given in a soluble form, are said by some writers to produce gastric irritation. Being an astringent, bismuth interferes with the normal action of the bowels, producing constipation; the *fæces* assume a leaden-gray colour, due to the partial conversion of the drug into the sulphide.

Externally, bismuth exerts *sedative*, *desiccant*, and *astringent* actions.

It is seldom prescribed internally for horses, but is a valuable *gastric sedative* in canine practice. Its use is indicated in gastric catarrh and in cases of dyspepsia accompanied by troublesome vomiting and gastric irritation.

The liquor bismuthi is frequently combined with pepsin, while dilute hydrocyanic acid and spirit of chloroform may be added if considered necessary. In consequence of the acid reaction of bismuth subnitrate, it is incompatible with sodium bicarbonate, and if these are dispensed together the evolution of carbonic acid gas will probably burst the bottle, unless the latter is left uncorked for some time. Hence it is preferable to prescribe the carbonate instead of the subnitrate in such cases. As bismuth preparations are very insoluble, it is necessary to suspend them in mixture by the addition of compound tragacanth powder or mucilage of tragacanth.

A combination of bismuth carbonate, magnesium carbonate and sodium bicarbonate, is found useful in cases of gastric catarrh.

The salicylate of bismuth and bismuth benzoate are preparations of the drug which are occasionally prescribed as intestinal disinfectants in cases of diarrhœa and intestinal irritation in calves and foals, the dose being from 15 to 40 grains.

There are various compounds of bismuth which have been brought forward from time to time as substitutes for the ordinary applications in the antiseptic treatment of wounds. So far as equine practice is concerned, the high price of these preparations renders them prohibitive for general use, and the advantages claimed for them are often more imaginary than real.

Thioform is a basic dithio-salicylate of bismuth, which is recommended as a desiccant antiseptic for the dry dressing of wounds. It is non-irritant, non-toxic, and inodorous.

Bismuthi subgallas—Dermatol—is recommended as a substitute for iodoform. It promotes cicatrization in wounds, and, lessening the secretion from weeping surfaces, it is used as a dusting-powder in cases of moist eczema.

Bismuthi oxy-iodogallas—Airol, airoform—has similar properties to the above.

CHAPTER IV

GROUP III.—THE NON-METALLIC ELEMENTS

CHLORUM (CHLORINE GAS).

PREPARED by heating common salt and black oxide of manganese with sulphuric acid.

Liquor chlori—Water charged with 2 volumes of chlorine gas.

ACTIONS AND USES.—Chlorine gas is *antiseptic*, *deodorant*, and *disinfectant*. If inhaled it irritates the respiratory passages. It is seldom employed in veterinary practice, other agents being more convenient and effectual as disinfectants.

The liquor chlori is an internal antiseptic which has proved useful in human medicine in the treatment of enteric fever; but in veterinary practice it has not yet been found of value.

The combination of calcium with chlorine has already received notice (see p. 113).

IODUM (IODINE).

PREPARED from kelp, the ashes of seaweed.

INCOMPATIBLES.—Alkalies, metallic salts, alkaloids, starch.

DOSES.—Horses, grs. xv. to ʒss.; cattle, ʒss. to ʒi.; dogs, gr. $\frac{1}{16}$ to gr. $\frac{1}{4}$. Administered in bolus or pill.

PREPARATIONS.

Tinctura iodi—Tincture of iodine. Iodine, $\frac{1}{2}$; potassium iodide, $\frac{1}{2}$; distilled water, $\frac{1}{2}$; alcohol (90 per cent.), q.s. to yield 20 (1 of iodine in 40).

Liquor iodi fortis—Strong solution of iodine, formerly known as liniment of iodine. Iodine, $1\frac{1}{4}$; potassium iodide, $\frac{3}{4}$; distilled water, $1\frac{1}{4}$; alcohol (90 per cent.), 9 (1 of iodine in $8\frac{1}{2}$).

Unguentum iodi—Iodine ointment. Iodine, 20 grains; potassium iodide, 20 grains; glycerine, 60 grains; lard 400 grains (1 of iodine in 25).

For use in horses, we prefer an ointment prepared with 1 part each of iodine and potassium iodide in 8 parts of lanolin, the latter being rendered sufficiently soft by admixture with vaseline.

Lugol's solution of iodine—Iodine, 20 grains: potassium iodide, 30 grains; water, 1 ounce.

Injectio iodi hypodermica—For hypodermic injections of iodine: Iodine, 5 grains; potassium iodide, 10 grains; rectified spirit, 2 drachms; water, 2 drachms.

Intratracheal injection of iodine—Iodine, 1 part; potassium iodide, 5 parts; water, 100 parts.

DOSE for the horse, 4 to 5 drachms, slowly injected into the trachea; or the following: Iodine, 30 grains; potassium iodide, $2\frac{1}{2}$ drachms; distilled water, 4 ounces. Half a drachm to 1 drachm in an equal amount of water.

Tinctura iodi decolorata—Decolourised tincture of iodine. Iodine, 250 grains; rectified spirit, $5\frac{1}{2}$ ounces. Dissolve with gentle heat; when cold add strong solution of ammonia 10 drachms; keep in a warm place until decolourised, after which add alcohol to make 20 ounces. This is practically a solution of ammonium iodide and iodate; it is colourless and does not stain the skin.

Pigmentum Picis cum Iodo—Coster's paste. Iodine, 2 drachms; rectified oil of tar, 1 ounce. Dissolve cautiously, applying heat if necessary. This is an efficient application for ringworm.

Potassii iodidum—Iodide of potassium.

PREPARED by dissolving iodine in hot liquor potassæ, evaporating, and mixing the residue with wood charcoal and fusing.

DOSES.—Horses, $\bar{\text{ss}}$. to $\bar{\text{ssii}}$.; cattle, $\bar{\text{ssii}}$. to $\bar{\text{ssiv}}$.; dogs,

grs. iii. to grs. x. Administered in solution twice daily, or in the food.

INCOMPATIBLES.— Sweet spirit of nitre; salts of iron (except ferri et ammonii citras and liq. ferri acetatis); salts of bisnuth and liquor strychninæ.

Sodii iodidum—Iodide of sodium.

PREPARED by the same process as iodide of potassium, solution of soda being used instead of potash. The doses are similar to those of the potassium salt.

Linimentum potassii iodidi cum sapone—Liniment of potassium iodide, with soap.

This is composed of soap, iodide of potassium, glycerine, oil of lemon, and water. This liniment does not stain nor irritate the skin. It is useful in canine practice, in the treatment of enlarged joints and indurated glands.

GENERAL ACTIONS OF IODINE AND ITS PREPARATIONS.

Externally, iodine acts as a stimulant to the skin, and if applied of sufficient strength it is an *irritant* and *vesicant*. In light-coloured animals it stains the skin a yellowish-brown.

It is *antiseptic*, *disinfectant*, *resolvent*, and a *parasiticide*.

Internally, iodine has special actions on mucous membranes and lymphatic glands. It stimulates the activity of glands, accelerates tissue changes, increases bronchial secretion, renders the latter more fluid, and thus facilitates expectoration. It is excreted by the respiratory mucous membrane, the skin, the kidneys, and the salivary glands. During its excretion it stimulates the epidermis and also acts as a sialagogue.

In *toxic* doses iodine is an irritant, causing diarrhœa, emaciation, loss of appetite, and the total refusal of water. In some instances large doses of the drug produce no toxic symptoms in horses and cattle. This may be accounted for by the large amount of starch in the food of herbivora, the insoluble iodide of starch being formed.

In the dog large doses of iodine cause gastro-enteritis,

hæmaturia, and the formation of small ulcers in the stomach.

If the drug be given in full doses for a length of time, a condition termed 'iodism' may result. This is evidenced by loss of appetite, dyspepsia, an irritable catarrhal condition of the mucous membrane of the nasal passages, pharynx, and eyes, also of the stomach, abstinence from water, emaciation, and a dry, scurfy condition of the skin.

ANTIDOTES.—The administration of starch, to convert the iodine into the insoluble iodide of starch; mineral tonics and vegetable bitters; and the prompt withdrawal of the drug.

Potassium iodide possesses similar actions to iodine, but it is *more soluble* and *less irritant*, and about half the strength of the latter. It is also more convenient for administration, and may be given either in powder or mixture.

Potassium iodide, if pure, is far less irritating to the stomach than iodine itself. If impure, it contains the iodate. This is decomposed by the gastric juice, and free iodine is liberated. If pure, only hydriodic acid is formed in the stomach.

Sodium iodide is less irritating and less depressing in its action than the potassium salt, and is preferred in cases characterised by debility or gastric irritability.

MEDICINAL USES.—As a *promoter of absorption*, potassium iodide is prescribed in cases of hydrothorax and ascites. In the secondary stages of pneumonia it produces beneficial effects by promoting absorption of the exudate, and for this purpose may be combined with preparations of iron.

In canine practice it proves useful in cases of chronic bronchitis, by rendering the secretion less viscid and facilitating expectoration.

In purpura hæmorrhagica it is occasionally prescribed in the form of intratracheal injections, about 5 drachms of a solution containing 1 part of iodine, 5 parts of potassium iodide, and 100 parts of water, being injected slowly into the trachea twice daily. Another solution can be prepared with 30 grains of iodine, 2½ drachms of potassium iodide, and 4 ounces of

distilled water, the dose being $\frac{1}{2}$ drachm to 1 drachm, diluted with an equal amount of water. Potassium iodide may also be prescribed in the form of bolus in this affection.

In actinomycosis in cattle, potassium iodide gives excellent results, $1\frac{1}{2}$ drachms dissolved in a pint of water being given three times daily for eight to ten days. The disease then usually shows signs of improvement, but in some cases a long course of the drug may be necessary.

In that troublesome sequel to castration termed 'scirrhus cord' or 'champignon,' and in cases of chronic abscess of the shoulder and other parts of the body which depend on the presence of the botryomyces, a long course of potassium iodide often causes the abnormal growths to disappear without an operation being necessary.

In cases of spinal affections both in the horse and dog potassium iodide is prescribed in combination with nux vomica. It probably acts by promoting absorption of the effused fluid that is present between the meninges and the cord.

In diabetes insipidus, either iodine or potassium iodide allays the excessive thirst and reduces the abnormal quantity of urine excreted. Some practitioners prefer the pure iodine administered in doses of $\frac{1}{2}$ drachm, with sulphate of iron 2 drachms, and gentian 4 drachms, in the form of bolus once daily. In severe cases it may be repeated twice a day. The *modus operandi* of the drug in this affection is not understood.

In lymphangitis, after the acute symptoms have abated, the administration of potassium iodide causes the abnormal thickening which remains in the limb to disappear.

In cases of milk-fever in cows, Schmidt's original form of treatment consisted of the injection into the udder of about $2\frac{1}{2}$ drachms of potassium iodide in a quart of sterilised water. One-fourth of this amount was injected into each teat. At present we find that the use of chinosol is less liable to produce mammitis as a sequel, and also that the injection of air into the udder gives as successful results.

Potassium iodide is an antidote in chronic cases of lead and mercury poisoning. It disengages these agents from

the tissues, and renders them capable of being excreted from the system.

Pure iodine is not prescribed in canine practice, and in many instances the iodide of sodium is better borne than the iodide of potassium.

In horses it is advisable to administer iodine a few hours after feeding, so as to diminish the tendency to the formation of the insoluble and inert iodide of starch.

In tetanus, the hypodermic injections of iodine solutions have been tried, with a varying degree of success.

In the treatment of bog-spavin, Mr. Deans, M.R.C.V.S., advises the injection into the affected joint of the following solution, after the withdrawal of the fluid by a special aspirator: $\mathfrak{z}\text{i}$. of decolourised tincture of iodine, combined with $\mathfrak{z}\text{i}$. of a solution containing 20 grains of hydrarg. perchlorid. in 1 ounce of spts. vini methylated.

Externally, iodine is applied to glandular enlargements, bursal distensions, etc.

In the treatment of enlarged and distended bursæ, an injection composed of 16 grains each of iodine and potassium iodide in an ounce of pure glycerine or distilled water is recommended, after removal of the fluid by the aspirator.

For the reduction of bony enlargements, an ointment composed of 1 part each of iodine and biniodide of mercury in 8 parts of lanolin is useful.

In the treatment of goitre, an ointment composed of potassium iodide 1 part, lanolin 8 parts, applied twice daily, gives good results.

The liniment of potassium iodide with soap and the decolourised tincture of iodine are useful in canine practice as absorbent applications, as they do not stain the skin.

As a *parasiticide*, iodine is employed in the treatment of ringworm. For this purpose the pigmentum Picis cum Iodo, applied with a brush once daily, gives good results.

In the treatment of periodic ophthalmia in the horse, Continental authorities advise the use of potassium iodide, both internally and locally.

Professor Brusasco, Turin, prescribes $\mathfrak{z}\text{iv}$. of the iodide

twice daily with sodium bicarbonate in the drinking water, or as a drench. A few drops of the following lotion should be instilled into the eyes twice daily :

R Potass. iod.	...	...	2·5 parts
Cocaine hydrochloride	...	...	1 part
Glycerine	...	...	8 parts
Aq. destil.	...	...	50 „

Dissolve the iodide in a portion of the water, add the glycerine, dissolve the cocaine in the remainder of the water, and mix the two solutions.

A 3 per cent. solution of potassium iodide in sterilised water should be applied to the eyes by means of a saturated compress constantly applied. When intolerance to light and hyperæsthesia disappear, omit the cocaine, but continue the iodide. If the eyes have been affected for some time, and synechiæ have formed, instil a few drops every three or four hours of a 1 per cent. solution of atropine, until symptoms of the above disappear. This treatment requires to be continued for four or five weeks, and it is said that the disease may be arrested or even recovery may occur.

Sulphuris iodidum—Iodide of sulphur.

PREPARED by heating iodine and sulphur together.

Unguentum sulphuris iodidi—Iodide of sulphur ointment (1 in 25 of benzoated lard).

This ointment is occasionally employed in the treatment of ringworm and other parasitic skin diseases in the dog.

BROMUM (BROMINE).

This is a liquid element obtained from sea-water and from some saline springs. The medicinal preparations are: potassium bromide, sodium bromide, and ammonium bromide.

Potassii bromidum—Bromide of potassium.

DOSES.—Horses, ʒss. to ʒi.; dogs, grs. x. to grs. xx. Administered in solution.

INCOMPATIBLES.—All oxidising agents which tend to set free bromine, also sweet spirit of nitre.

Sodii bromidum—Bromide of sodium.

DOSES.—Similar to the above.

ACTIONS AND USES.—All bromides lessen the activity of the nervous system, and act as sedatives to the brain and spinal cord. They are also soporifics or hypnotics. By some obscure chemical action they depress the processes by which functional activity of the brain is kept up, and also depress reflex excitability of the spinal cord.

Toxic doses are cardiac depressants, and also produce muscular weakness, an unsteady gait, impaired reflex movements, and a listless condition. Full doses continued for some time may induce a condition known as 'bromism,' which is evidenced by cerebral depression, feebleness, anæmia, and in some instances the appearance of an eruption resembling acne. These symptoms, however, are very rare in veterinary practice.

MEDICINAL USES.—Potassium bromide is the salt of bromine, usually employed in equine practice. Sodium bromide is less depressant and better tolerated by the stomach, hence it is preferred in canine practice in cases where debility and gastric irritation are present.

Ammonium bromide is slightly stimulating in its action, and its use is indicated when cardiac weakness is a complication. In some cases the three salts of bromine are combined. In cases of epileptic convulsions in dogs the bromides lessen excitability, and are given in full doses. In chorea they act as palliative remedies when the symptoms are violent.

They are also useful in the treatment of puerperal eclampsia occurring in the bitch, and may be combined with chloral hydrate in such cases. Although antagonistic to the actions of strychnine, the bromide of potassium is not a reliable antidote in cases of poisoning by that agent.

In the earlier stages of pericarditis, and in all cases where cardiac palpitation is a prominent symptom, the bromides prove useful.

SULPHUR.

SOURCE.—Occurs native as a product of volcanic action in soils in Sicily and Italy.

Sulphur sublimatum—Sublimed sulphur; flowers of sulphur.

PREPARED from crude sulphur by subliming.

DOSES.—As a laxative: horses, $\bar{3}$ i. to $\bar{3}$ ii.; cattle, $\bar{3}$ iii. to $\bar{3}$ iv.; sheep and pigs, $\bar{3}$ ss. to $\bar{3}$ i.; dogs, gr. xv. to $\bar{3}$ ii. As an alterative, one-fourth of these doses is prescribed.

Sulphur præcipitatum—Precipitated sulphur; milk of sulphur.

PREPARED by boiling sublimed sulphur with slaked lime in water, and precipitating the filtrate with dilute hydrochloric acid.

DOSES.—Similar to those of sublimed sulphur.

Lotio sulphuris—Precipitated sulphur, $\frac{1}{2}$ ounce; glycerine, 2 drachms; alcohol, 1 ounce; lime-water, 3 ounces; rose-water, 3 ounces. This is sometimes used in skin affections in canine practice.

Unguentum sulphuris—Precipitated sulphur, 2 parts; potassium carbonate, 1 part; lanolin, 8 parts.

Lotio calcii sulphurati—Sublimed sulphur, 8 ounces; quicklime, 1 pound; water, 4 pints. Simmer until the mixture becomes of a golden yellow colour, and filter after three days.

GENERAL ACTIONS OF SULPHUR.—The precipitated form is stated to be more active than the sublimed, in consequence of its finely-divided condition and freedom from grittiness. It is preferred for the preparation of ointments and liniments. Sulphur destroys low forms of living organisms. It is believed to be taken up by them, and then transformed into sulphuretted hydrogen and sulphurous acid. In the form of sulphurous acid gas it acts as a disinfectant. Applied to the skin in the form of sulphur ointment, it stimulates the superficial layers and hastens desquamation. This action is increased if it be combined with an alkali, such as potassium carbonate.

Internally, sulphur is absorbed from the stomach and

intestines in the form of sulphides, and enters the blood in this form. It acts as a stimulant to the intestines, renders their contents in a soft condition, and thus has a laxative effect. It is excreted by the intestines, the kidneys, the lungs, and largely by the skin. On the latter it has a slight diaphoretic action, and is excreted in the form of sulphides and sulphuretted hydrogen. In very large doses it produces irritant effects, evidenced by colicky pains, and purging; in some instances recorded, gastro-enteritis was observed, as well as paralysis of the vital nerve-centres.

MEDICINAL USES.—As an *alterative*, it is prescribed in affections of the skin, and it forms a favourite constituent of condition and alterative powders. It may be combined with other alterative agents, and is readily taken in the food. In canine practice it is a useful laxative agent, and is largely employed for this purpose.

Externally, sulphur is used as a parasiticide in the treatment of mange in all species of animals. Various formulæ are recommended for such cases, the most efficacious containing potassium carbonate, which is believed to increase the formation of sulphuretted hydrogen and sulphides, thus helping to destroy the parasites on which this affection depends. The alkali also enables the sulphur to penetrate the affected parts by softening and removing the crusts and scales that are formed on the skin.

For the horse, 2 parts of sublimed sulphur, 1 part of potassium carbonate, 1 part oil of tar, and 8 parts raw linseed-oil, forms a serviceable dressing. This is applied as follows: Wash the affected parts thoroughly with soft-soap and warm water, apply the dressing, and let it remain in for two days, then wash off and reapply.

The unguentum sulphuris is a suitable application for mange in the dog; while for the small breeds of house dogs the lotio sulphuris is convenient, as is also a liniment composed of precipitated sulphur, 1 part; zinc oxide, 1 part; white vaseline-oil, 8 parts.

The lotio calcii sulphurati is recommended as a mange dressing for the horse, also as a sheep-dip.

Sulphurous acid gas, prepared by burning sulphur mixed with $\frac{1}{10}$ part of charcoal, is sometimes employed as a disinfectant for stables and farm buildings, but unless large quantities are used, and precautions taken to close all doors, windows, etc., this method will not prove effectual. At one time it was used as an inhalation in the treatment of parasitic bronchitis in calves and lambs, but it proved neither safe nor effectual for this purpose.

CARBO (CARBON, CHARCOAL).

Two forms of carbon are recognised—viz.: (1) *Carbo animalis*; (2) *carbo ligni*.

(1) **Carbo animalis**—Animal charcoal (omitted from the B.P.).

PREPARED by exposing bones to a red heat, excluding air, and powdering the residue.

(2) **Carbo ligni**—Wood charcoal.

PREPARED from wood charred by exposure to a red heat and excluding air.

GENERAL ACTIONS.—*Externally*, charcoal acts as a *desiccant*, *disinfectant*, and *deodorant*. It possesses the property of absorbing and condensing many gaseous bodies and vapours. It absorbs but little hydrogen, although it will take up a considerable amount of oxygen and large quantities of sulphuretted hydrogen and ammonia. Its action on noxious gases is believed to depend on the oxygen which it retains, oxidising and deodorising them. Some authorities state that it has the power of absorbing and condensing the noxious gases in its pores.

Internally, charcoal given in sufficient amount is said to have the power of checking fermentative changes while passing through the alimentary canal, and by virtue of this action it may prevent the occurrence of flatulence. This action, however, is doubtful. It possesses the power of attracting alkaloids from their solutions in the stomach and rendering them inert; hence animal charcoal has been recommended by Dr. Garrod as an antidote in cases of poisoning by morphine, aconite, strychnine, etc.

Charcoal is removed from the system entirely by the intestines, and, not being absorbed, it does not exert any specific action on the body.

MEDICINAL USES.—As an agent to check the formation of gases due to fermentative changes in the alimentary canal, charcoal is sometimes prescribed in cases of flatulence, in doses of ʒss. to ʒii. for horses and cattle, and grs. xx. to ʒi. for dogs.

Externally, it is occasionally employed as a *deodorant* and *disinfectant* to unhealthy ulcers or foul wounds, being applied directly in the dry form ; but as it does not possess antiseptic actions, other agents are preferred.

CHAPTER V

GROUP IV.—ACIDS

GENERAL ACTIONS OF ACIDS

FOR convenience of description, the acids employed in veterinary practice may be arranged under the headings of inorganic and organic.

Many of the organic acids have actions and uses which are but slightly connected with their properties as acids, hence they will not receive notice in this chapter, but will be considered under separate headings.

The mineral acids—viz., sulphuric, nitric, and hydrochloric—when undiluted are *caustics* and *escharotics*; internally, they are violent *corrosive* and *irritant* poisons.

Administered in the dilute form and in medicinal doses, acids act as *sialagogues* and thus relieve thirst. If given *before* feeding, in cases of acid dyspepsia, they check excessive gastric secretion and lessen acidity; they also destroy the organisms which cause fermentation, and thus prevent the formation of organic acids and the evolution of gases.

If administered shortly *after* feeding, they increase the acidity of the gastric secretion, and thus assist digestion when the natural acid is deficient.

Hydrochloric acid acts chiefly on the stomach, aiding digestion, sulphuric acid on the intestines as an astringent, and nitric acid on the liver as a cholagogue. Acids are believed to render the blood less alkaline in character, but they do not produce an acid reaction therein. They are chiefly excreted by the kidneys and may render the urine slightly acid.

Acetic, citric, and tartaric acids, if prescribed with an

alkaline base, are excreted as carbonates. They do not render the urine acid.

All acids should be given properly diluted with water, and not continued for too long a period.

INORGANIC ACIDS.

Acidum sulphuricum—Sulphuric acid ; oil of vitriol.

PREPARED by the combustion of sulphur, the resulting sulphurous acid being subjected to oxidation and hydration by means of nitrous and aqueous vapours.

Acidum sulphuricum dilutum—Dilute sulphuric acid.—1 in 12 of distilled water ; 12 minims contain 1 minim of strong sulphuric acid.

INCOMPATIBLES.—Alkalies and their carbonates, salts of calcium and lead.

DOSES.—Of the dilute acid : horses, $\bar{3}$ i. to $\bar{5}$ ii. ; cattle, $\bar{5}$ ii. to $\bar{5}$ iv. ; dogs, \mathfrak{M} v. to \mathfrak{M} xv. Administered freely diluted, in combination with vegetable bitters.

Acidum sulphuricum aromaticum—Aromatic sulphuric acid.—Sulphuric acid, 6 ; alcohol, 59 ; tincture of ginger, 20 ; spirit of cinnamon, 1.

DOSES.—Similar to those of the dilute sulphuric acid.

ACTIONS AND USES.—Strong sulphuric acid is a powerful *caustic* and *escharotic*. It destroys the tissues to a considerable extent, producing a brown or black eschar or slough.

Internally, it is a corrosive irritant poison, causing erosions of a brown or black colour in the mucous membrane of the mouth, pharynx, œsophagus, and stomach, death resulting from collapse. In some cases the acute inflammation of the throat produces extensive swelling, with asphyxia as a result.

In the dog, violent emesis occurs, the vomited matters being dark-coloured, blood-stained, and containing shreds of mucous membrane.

The ANTIDOTES are : Alkaline carbonates, especially magnesia ; also chalk, white of egg, carron-oil, milk, lime-water, emollient and demulcent drinks, opiates to relieve pain, and stimulants to prevent collapse. The strong sulphuric acid is not employed as a medicinal agent.

The dilute acid and the aromatic preparation are tonics and intestinal astringents. They increase appetite, promote digestion, and exert an astringent action on the intestinal bloodvessels. In chronic diarrhœa and dysentery they give excellent results, and may be prescribed in combination with opiates, astringents, and carminatives (see p. 485).

Dilute sulphuric acid, combined with sulphate of iron, is recommended in the treatment of purpura hæmorrhagica. It is an efficient antidote in cases of chronic lead-poisoning. In pharmacy it is employed as a solvent for quinine.

Externally, sulphuric acid mixed with linseed-oil was recommended as a local application to contract and remove umbilical herniæ in foals; but such treatment may prove dangerous, and is not in accordance with modern surgical principles.

Acidum nitricum—Nitric acid; aqua fortis.

PREPARED by distilling a mixture of potassium nitrate and sulphuric acid.

Acidum nitricum dilutum—About 1 to 5 of distilled water; 5 minims contain about 1 minim of strong acid.

DOSES.—Of the dilute acid: horses and cattle, ʒi. to ʒii.; dogs, ℥v. to ℥x. Administered properly diluted, and combined with aromatic bitters.

INCOMPATIBLES.—Alcohol, alkalies, carbonates, sulphides, ferrous sulphate, lead acetate.

ACTIONS AND USES.—*Externally*, strong nitric acid is a caustic and escharotic; it is slower in its action than sulphuric acid, but penetrates the tissues deeply, producing an extensive slough. It stains the skin a yellow or brownish colour, due to the formation of picric acid.

Internally, in toxic amounts it is a corrosive irritant poison, causing in the dog violent vomiting, the vomited matter containing altered blood of a brown colour, and shreds of membrane stained yellow. The mouth, throat, and stomach are acutely inflamed.

The ANTIDOTES are similar to those recommended for sulphuric acid.

The strong acid is not used internally. The dilute acid is

an hepatic stimulant, causing an increased flow of bile ; and is also a stomachic tonic. It is sometimes prescribed in cases of torpidity of the liver which occur in subjects recovering from debilitating affections, such as influenza.

Externally, the strong acid is occasionally employed as a caustic for the removal of warts, fungus growths, etc. ; but great care is necessary in the application, and serious injuries have resulted when it has been carelessly applied to warty growths, especially if close to joints or on the horse's heels or coronet. In the latter situations we have seen a large horny growth appear as the result of the application of nitric acid for the removal of a simple wart.

In cases of chronic papular eruptions of the skin, which are sometimes met with in aged dogs suffering from renal affections, Mr. H. Gray, M.R.C.V.S., has found that the application of very weak solutions of dilute nitric acid to the skin causes the eruptions to disappear.

Acidum hydrochloricum—Hydrochloric acid ; muriatic acid ; spirits of salt.

PREPARED by the action of sulphuric acid upon chloride of sodium, and solution of the fumes in water.

Acidum hydrochloricum dilutum—Dilute hydrochloric acid : 1 in $3\frac{1}{3}$ of distilled water.

DOSES.—Of the dilute acid, similar to those of dilute nitric acid.

INCOMPATIBLES.—Salts of silver and lead, alkalies and their carbonates.

ACTIONS AND USES.—The strong hydrochloric acid applied externally is an *active caustic*, causing the formation of a white film on the tissues with which it comes in contact.

Internally, in toxic amounts it is an irritant corrosive poison, resembling in its actions the other mineral acids just described.

The antidotes are also similar to the above.

The dilute hydrochloric acid is a sialagogue, increasing the flow of saliva. Given *after* feeding, it increases the secretion of gastric juice, and thus aids digestion. If administered *before* feeding, it checks excessive secretion of acid and pro-

motes appetite. In consequence of these actions, the dilute hydrochloric acid is prescribed in cases of functional disorders of the stomach.

In order to treat such cases in a rational manner, it is necessary to ascertain the conditions on which the symptoms of indigestion depend, as in some instances acids administered at stated times are indicated, while in others alkalies give better results. The strong acid is not used internally.

In acidity of the stomach, depending on excessive fermentation in the gastric contents, and leading to the formation of various organic acids, the dilute hydrochloric acid is sometimes prescribed, in combination with vegetable tonics and bitters, before feeding.

In renal concretions, and in cases of sabulous deposits in the bladder, evidenced by a large amount of sediment in the urine, the dilute hydrochloric acid administered internally may dissolve the earthy carbonates, and render them capable of being removed in the urine.

Externally, hydrochloric acid is employed as a caustic in the removal of warty growths, etc. In cases of superficial necrosis, if applied properly diluted, it assists removal of the diseased portion, and thus hastens healing.

In cases of foetid breath, dirty teeth, and bleeding of the gums, which are seen in dogs of all ages, Mr. H. Gray recommends the following solution to be brushed on the tongue and gums once daily: Dilute hydrochloric acid, ʒii.; aqua, O.i.

Acidum nitro-hydrochloricum dilutum—Dilute nitro-hydrochloric acid; dilute nitro-muriatic acid; aqua regia.

PREPARED with nitric acid, 3; hydrochloric acid, 4; distilled water, 25. Sixteen minims equal $1\frac{1}{2}$ minims of nitric acid and 2 minims of hydrochloric acid.

DOSES.—Similar to those of dilute nitric acid.

INCOMPATIBLES.—Alkalies, carbonates, sulphides, salts of silver and lead.

ACTIONS AND USES.—It is a *cholagogue* and *gastric tonic*. It directly stimulates the secretion of bile, and is prescribed in torpidity of the liver, and in cases of jaundice when

not depending on obstruction of the bile-duct or on acute hepatitis.

In that affection of horses termed *oxaluria*, characterised by debility, loss of flesh, stiffness in the loins, a dry, scurfy condition of the skin, the frequent passage of pale-coloured urine, acid or neutral in reaction, and containing oxalate of lime, the nitro-hydrochloric acid, in combination with tincture of nux vomica and gentian, gives very beneficial results.

As this affection depends on impaired digestion, due to dietetic errors, it is necessary that dietetic and hygienic precautions be adopted in addition to medicinal treatment (see p. 524).

Acidum chromicum—Chromic acid.

PREPARED by the interaction of sulphuric acid and potassium bichromate.

Liquor acidi chromici—1 to 3 of water.

ACTIONS AND USES.—Chromic acid is a *penetrating caustic*, and, in concentrated form, an *escharotic*. It is a powerful oxidising agent, and, if applied in a warm concentrated solution, it rapidly dissolves all animal tissues. It is occasionally employed in the treatment of that affection of the horse's foot known as canker, also in the treatment of malignant growths.

It should be carefully applied with a glass rod, and if proper precautions be adopted, and if the agent be free from sulphuric acid, its action does not tend to spread beyond the area to which it is applied. Chromic acid is not prescribed for internal use.

Acidum boricum—Boric acid; boracic acid.

PREPARED by the purification of native boric acid, or by the action of sulphuric acid on borax.

DOSES.—Horses and cattle, ʒii. to ʒiv. ; dogs, grs. v. to grs. xv.

PREPARATIONS.—**Glycerinum acidi borici**—Boric acid, 6; glycerine, 9. Heat and mix with 10 parts of glycerine.

Unguentum acidi borici—Boric ointment. — 1 of boric acid to 9 of white paraffin ointment.

Boric lint.—Lint containing 50 per cent. of boric acid. It should not be scaly.

Boric gauze—Gauze containing 20 per cent. of boric acid.

Boric wool—Wool containing from 20 to 50 per cent. of boric acid.

Borax—Biborate of sodium.

PREPARED by boiling together boric acid and carbonate of soda. It is also found native.

INCOMPATIBLES.—Mineral acids and most of their metallic salts; also alkaloidal salts.

Glycerinum boracis—1 of borax to 6 of glycerine.

DOSES.—Horses, $\bar{3}$ i. ; dogs, $\bar{5}$ ss. to $\bar{3}$ i.

Mel boracis—Borax, 2 ; glycerine, 1 ; clarified honey, 16. About 1 in 7.

DOSES.—Similar to those of glycerinum boracis.

ACTIONS AND USES.—Boric acid and borax are similar in their actions, but the latter possesses in addition slightly *astringent* properties. Boric acid is a non-irritating *antiseptic*, less powerful than carbolic acid and similar agents, but practically non-poisonous. It checks fermentation in the alimentary canal, is excreted by the kidneys, and exerts antiseptic effects on the bladder and urino-genital mucous membrane. A 3 per cent. solution lessens irritability of the skin, while a 5 per cent. solution exerts antiseptic effects in wounds. It is used as an antiseptic dressing for simple wounds in the horse, and is especially useful for this purpose in canine practice.

Boric lint forms an excellent dressing for punctured wounds, two or three folds of this material being soaked in a hot solution of boric acid and applied to the part, which is then covered with oiled silk, wool, and a bandage. This forms an antiseptic poultice, and is also applicable to other conditions in which moist dressings are indicated. The lint can be kept moist by pouring in a further supply of a hot boric solution between the dressing and the part at intervals. In the dry dressing of wounds boric acid is largely employed. For this purpose it may be combined with oxide of zinc and starch.

In unhealthy wounds, ulcerated surfaces, and in cases of fissured heels, boric acid in combination with iodoform and oxide of zinc forms a useful application used in the following proportions: Iodoform, 1 part; boric acid, 2 parts; and zinc oxide, 2 parts. This also forms an excellent dressing for canker of the ear in the dog.

In catarrhal and purulent conjunctivitis, a lotion consisting of boric acid (4 grains), laurel-water ($\frac{1}{2}$ ounce), and rose-water ($\frac{1}{2}$ ounce) lessens irritability and reduces the discharge.

In the treatment of vesical catarrh, boric acid in combination with other remedies is prescribed. It prevents decomposition in the urine, and exerts antiseptic effects in the urinary passages (see p. 528).

It is occasionally prescribed in the treatment of fermentative diarrhœa in foals and calves.

Boric ointment, either alone or combined with other agents, is useful in cases of erythema and eczematous conditions of the skin in dogs.

Toxic symptoms resulting from the absorption of boric dressings, such as occasionally occur in human practice, are not observed in animals.

Borax, in the form of glycerinum boracis, or mel boracis, is employed as a mouth-wash in aphthous conditions, ulcerations of the mouth, tongue, and fauces, and in glossitis. For these purposes it is combined with potassium chlorate and tincture of myrrh (see p. 413).

Similar preparations are also useful in the treatment of pharyngitis in the dog.

Solutions of borax are recommended as injections for the udder in the treatment of mammitis, also as injections in cases of leucorrhœa.

ORGANIC ACIDS.

Acidum aceticum—Acetic acid.

PREPARED from wood by destructive distillation, also from the oxidation of ethylic alcohol.

Acidum aceticum dilutum—Dilute acetic acid: 1 of acetic acid to 7 of distilled water.

Acidum aceticum glaciale—Glacial acetic acid.

PREPARED from acetate of sodium and sulphuric acid.

Acetum—Vinegar—contains 5·41 per cent. of acetic acid.

PREPARED by the acetous fermentation of a mixture of malt and unmalted grain.

ACTIONS AND USES.—*Externally*, strong acetic acid is *corrosive* and *irritant*; the dilute acid, when applied in sufficient amount, is a *stimulant* and *vesicant*.

Internally, the strong acid is a corrosive irritant poison, the dog being more susceptible to its actions than horses or cattle; 4 or 5 ounces of vinegar are stated to have produced fatal effects in the dog.

The ANTIDOTES are magnesia, lime-water, chalk and water.

Acetic acid is not prescribed for internal use.

Externally, the strong acid is frequently employed as a caustic in the treatment of warts.

The dilute acid, also vinegar, are antidotes in cases of poisoning by alkalies. They are also employed in pharmacy as solvents for certain drugs, such preparations being termed 'aceta.'

Acidum tartaricum—Tartaric acid.

Acidum citricum—Citric acid.

These acids are devoid of irritant or toxic properties. They are not employed in veterinary practice.

CHAPTER VI

GROUP V.—WATER

AQUA (WATER).

ACTIONS AND USES.—*Externally*, water is employed as a means of applying either cold or heat to various parts of the body. Cold water is *refrigerant*, and exerts tonic and constringing effects on the parts to which it is applied. It causes contraction of the bloodvessels, and lessens the supply of blood going to the part. It is extensively employed to reduce inflammatory action in cases of open joints, opened bursæ, inflammation of the sheaths of tendons, strains of tendons and ligaments, etc. In such instances the parts are irrigated by means of a continuous flow of water from a hose-pipe.

Hot water applied in the form of fomentation is emollient and anodyne. It dilates capillaries, relaxes the tissues, and reduces tension on the nerves of the part, acts as a sedative to the latter, and thus relieves pain.

The choice of cold or hot applications requires discrimination on the part of the practitioner. As a rule, when pain and tension are prominent symptoms, the use of hot applications is indicated; these must, however, be used with discretion, whether in the form of fomentations or poultices. They should not be employed too hot, and the suitable temperature should be ascertained by testing them with the point of the elbow, and not with the hand, as the skin of the latter is not sufficiently sensitive for the purpose. Hot applications should not be continued for too long a period, as they tend to produce a softened, unhealthy condition of the part. In certain cases, such as in erysipelas, they are

contra-indicated, as they increase the tendency to sloughing of the skin and subcutaneous tissues.

Cold water dashed over the head and neck acts as a stimulant, and causes increased respiratory movements. It is sometimes employed in cases of narcotic poisoning, but is of little use in overcoming the toxic effects of chloroform.

Ice, as a local application to the head, is employed in cases of meningitis, phrenitis, etc.

In equine practice the use of hot fomentations to the thoracic walls in respiratory affections, and to the abdominal region in cases of intestinal diseases, would be more serviceable if it were possible to apply them in a satisfactory manner. The large area over the affected parts, and the difficulty of keeping the hot applications (which are usually rugs wrung out of hot water) in close contact with the skin, render it very difficult to prevent the evil effects of reaction, or to keep up a continuous supply of heat.

In canine practice, however, the application of heat by means of flannel wrung out of hot water can be carried out with greater facility and better results.

The inhalation of steam, medicated with oil of eucalyptus or terebene, proves very useful in the treatment of laryngitis, pharyngitis, bronchitis, and pneumonia in all animals (see p. 576).

Cold water should be freely allowed in the treatment of febrile affections; it allays thirst, promotes the action of the bowels and kidneys, and lowers temperature.

Cold water is contra indicated directly after feeding, or when the horse is in a heated condition after exertion, also after the administration of a cathartic dose of aloes. In the latter instances warm drinks should be allowed.

Water at a temperature of 120° F. is a hæmostatic, and may be employed for this purpose when other means are not at hand. Water is also employed in the form of enemata (see p. 85) and of baths (see p. 89).

Aqua destillata—Distilled water—is used for pharmaceutical purposes and in dispensing.

OXYGEN.

For convenience of description, this agent is considered here.

In the treatment of pneumonia in human practice, the inhalation of oxygen proves of value in cases where one lung is beginning to clear up, but consolidation is commencing in the other lung. If the latter proceeds more rapidly than the former, there is grave danger to life, and the use of oxygen may enable respiration to be carried on until the first lung affected is able to resume its function. The practical value of this treatment has not yet been demonstrated in veterinary practice.

The injection of oxygen into the udder by means of a special apparatus is recommended in the treatment of milk-fever; but the employment of ordinary air for this purpose appears to give equally satisfactory results, and is far more economical and convenient.

In very severe cases, however, and in those that have been neglected or badly treated, oxygen often gives good results, and its employment is indicated.

CHAPTER VII

GROUP VI.—THE CARBON COMPOUNDS

ALCOHOL.

Alcohol absolutum—Absolute alcohol.

This is ethylic alcohol, containing not more than 1 per cent. of water. It is not used for medicinal purposes.

The following forms of alcohol are employed for therapeutical purposes:

Spiritus rectificatus—Rectified spirits—contains 90 per cent. by volume of alcohol. It is obtained by the distillation of fermented saccharine liquids.

Spiritus tenuior—Proof spirit—contains 57 per cent. by volume of alcohol, and is prepared by mixing 5 volumes of rectified spirit with 3 volumes of distilled water.

Spiritus methylatus—Methylated spirit—a mixture of rectified spirit with 10 per cent. by volume of wood naphtha. For retail use it contains, in addition, $\frac{3}{8}$ per cent. of mineral naphtha, and is known as 'denaturalized methylated spirit,' and forms a turbid mixture with water. It is not employed for internal use.

Spiritus frumenti—Whisky—contains 51 to 58 per cent. of alcohol.

Spiritus vini gallici—Brandy—contains $43\frac{1}{2}$ per cent. of alcohol.

Vinum xericum—Sherry—contains from 16 to 22 per cent. of alcohol.

Port contains from 20 to 30 per cent. of alcohol.

Gin, Hollands, and Geneva contain 51 per cent. of alcohol.

Ale, Porter, and Stout contain from 2 to 9 per cent. of alcohol.

GENERAL ACTIONS OF ALCOHOL.

Externally, alcohol is refrigerant, antiseptic, and slightly astringent. If in concentrated form and applied with friction, it acts as a rubefacient. By its evaporation it withdraws heat from the surface of the part, and by causing vascular constriction it lessens the local cutaneous circulation.

Internally, in moderate doses, alcohol is a *stimulant*, an *anti-spasmodic*, and a *carminative*. It stimulates the gastric mucous membrane, causes dilatation of the bloodvessels, increase of the blood-supply and of the gastric secretion. It is rapidly absorbed, and exerts important actions on the heart, the circulation, and the nervous system. It increases the force and frequency of the heart's action, and causes increased circulatory activity. This effect is produced both by reflex stimulation from the gastric mucous membrane, and by direct stimulation of the nervo-muscular structures of the heart itself, also by stimulation of the cardiac centre in the medulla. It causes dilatation of the cutaneous bloodvessels, and diverts the blood to the surface of the body, thus exerting a cooling influence on the system. It diminishes oxidation in the system and lessens tissue waste, but the manner in which this effect is brought about is not clearly understood. The result of diminishing oxidation and dilating the cutaneous bloodvessels is to cause a lowering of the temperature of the body.

On the *nervous system*, the *primary* effect of alcohol is that of stimulation of the cerebrum and nerve-centres. It dilates the cerebral bloodvessels, but in full doses it also lessens the activity of the brain-cells by a direct action thereon.

In *moderate* doses, alcohol becomes oxidised in the system, and not only acts as a stimulant, but also as a food. In cases of fever, some authorities believe that the agent undergoes oxidation to a greater extent.

TOXIC EFFECTS.—In excessive doses, alcohol acts as a

narcotic poison, and proves fatal by producing paralysis of the vital nerve-centres.

After a stage of excitement the functions of the brain become disturbed, then loss of consciousness occurs, and, if very large amounts have been given, a condition of paralysis of the vital nerve-centres ensues. The more concentrated forms of alcohol prove far more toxic than diluted solutions. Usually the respiratory centre is the first to become paralysed, but in some instances respiration and circulation fail simultaneously.

In the horse preliminary excitement is well marked and accompanied by an unsteady gait, with spasmodic movements of the limbs; the pupils are at first contracted, then dilated, and in the final stages either convulsions or coma occur.

In the dog there is very little preliminary excitement, and after a toxic dose has been administered the animal becomes rapidly comatose.

Cattle and sheep are less susceptible to the action of alcohol, and are only affected by very large amounts of this agent.

Cases are recorded of chronic alcoholic poisoning in cattle supplied with the dregs or wash from distilleries; but with this exception cases of poisoning by alcohol are very rare in veterinary practice. The suitable *antidotes* are the application of cold water to the head and neck and the hypodermic injection of strychnine. In the dog, apomorphine may be given by hypodermic injection as an emetic; the inhalation of amyl nitrite is also advised.

MEDICINAL USES.—As a *stimulant*, alcohol, in the form of whisky, is largely employed. In cases of exhaustion from overwork, etc., and in the shivering fit which usually ushers in an attack of influenza, the judicious administration of alcohol as a diffusible stimulant is indicated.

In the treatment of respiratory affections the indiscriminate use of alcohol must be condemned. If the appetite is maintained and the pulse shows no indication of weakness, alcohol is neither necessary nor useful, as simple salines, with attention to dietetic and hygienic measures, constitute the rational

treatment (see p. 573). Stimulants, when not required, cannot be productive of beneficial results. In addition, we must bear in mind that the administration of drenches is usually resisted by the patient, and not only distresses him, but also there is the risk of some of the fluid entering the trachea and bronchi when medicines are administered by unskilled hands. The indications for alcohol in such cases are a frequent and weak pulse, a high temperature, dryness of the skin, and total loss of appetite. When indicated, the careful administration of 4 ounces of whisky with a diffusible stimulant, such as sweet spirit of nitre, every four hours gives good results. But the effects should be watched, and when appetite returns and an improvement in the character of the pulse is observed, the stimulants should be withheld.

Alcohol is seldom required during the first stages of respiratory affections; it is during the secondary stages that stimulants are indicated. We learn from experience that the majority of cases of pneumonia do not require the administration of alcohol, and we are also aware that the risk of mechanical bronchitis from careless drenching overbalances the advantages that are likely to ensue from the use of this agent.

In cattle practice strong ale is largely used as a stimulant and tonic. It is indicated in cases of indigestion depending on loss of nerve-power in the stomach, and in convalescence from debilitating affections. From 1 to 2 pints are prescribed three times daily, and other medicinal agents are combined, according to the nature of the case (see p. 441).

In canine practice alcohol is usually prescribed in the form of either brandy or port. When prescribing stimulants for the dog, we must remember how easily the stomach of this animal becomes deranged, hence small and carefully-regulated doses should be ordered.

In the treatment of canine distemper alcoholic stimulants are often indicated, and their judicious employment is productive of good results. If they disagree with the stomach they should be discontinued and other forms of stimulants substituted.

In diarrhœa and dysentery port wine, possessing both stimulant and astringent actions, gives good results.

CONTRA-INDICATIONS.—Alcohol is contra-indicated in all conditions of cerebral excitement, congestion of the brain, meningitis, etc. ; in cases of shock depending on concussion or injury to the brain ; and in cases of nephritis, hepatitis, and gastritis.

EXTERNAL USES.—Alcohol enters into the composition of various liniments. In the form of rectified spirit and proof spirit, it is largely employed in the preparation of tinctures and extracts.

CHAPTER VIII

THE CARBON COMPOUNDS (*continued*)

REMARKS ON THE ACTION OF ANÆSTHETICS.

GENERAL anæsthetics produce loss of consciousness and abolish sensation and voluntary muscular action.

The vapour of certain volatile drugs, when inhaled, has the power of producing these effects, and in veterinary practice the agents used for producing general anæsthesia are *chloroform* and *ether*.

The exact manner in which chloroform and ether act on the nervous system so as to prevent the occurrence of pain during surgical operations is not yet thoroughly understood; but so far as our present knowledge is concerned, they appear to exert a direct action on the cerebrum, which prevents the reception of painful impressions.

Anæsthetics, to a certain extent, possess actions similar to those of alcohol, but some important differences require notice.

Four stages in the actions of each are recognised—viz., (1) stimulant, (2) narcotic, (3) anæsthetic, (4) paralytic.

The *stimulant* stage is evidenced by a degree of excitement, which varies according to the temperament of the animal.

In the *narcotic* stage the cerebral functions are depressed, and the early period may be represented by struggling, and in horses by fits of neighing.

In the *anæsthetic* stage the power of voluntary movement is lost, and sensations of pain can no longer be felt. The muscles become relaxed and spinal reflex action disappears. If the drug be pushed still further, the *paralytic* stage is reached; in this the vital nerve-centres in the medulla become

paralysed as well as the cerebrum; the respiratory centre fails to perform its function, and death occurs from asphyxia.

In the case of alcohol these stages are very prolonged, and exceedingly large doses are required to produce such effects, so that it would be neither safe nor convenient to employ this agent as an anæsthetic. These stages are shorter with ether and shorter still with chloroform.

Chloroform and ether are selected as general anæsthetics in consequence of the order in which the cerebrum and vital centres are involved by the action of these drugs. The functions of the cerebrum are first acted upon, so that consciousness and sensation are completely removed before any *serious depression* of the vital nerve-centres occurs.

In the case of other agents, such as opium and chloral hydrate, the cerebrum and medulla are *simultaneously* involved, so that by the time consciousness is removed fatal depression and paralysis of the vital nerve-centres occur.

As chloroform contains chlorine, it is more powerful and more poisonous than ether, and the paralytic stage is reached more quickly, as it has a greater tendency to paralyse nervous and muscular structures.

In the case of ether the stimulant or exciting stage is far longer, its action is slower, and it produces no paralysing effect on muscular fibre.

In human practice **Nitrous Oxide Gas** is employed as an anæsthetic for minor operations. Its action only lasts a very short time, and it is very safe; but we are not aware of its successful application in veterinary practice. It produces anæsthesia very rapidly, and this action is believed to depend not only on certain changes which the agent exerts on the blood, rendering it partially venous in character, but is also attributable to a special effect on the cerebrum. If administered without any admixture of air, very little exciting effects are produced.

CHLOROFORM.

Chloroformum—Chloroform; pure chloroform.

PREPARED by distilling rectified spirit with chlorinated

lime and slaked lime, purifying, and adding 1 per cent. by weight of absolute alcohol.

Methylated Chloroform is prepared in a similar manner to the above, but methylated spirit is substituted for rectified spirit.

Spiritus chloroformi—Spirit of chloroform; chloric ether : 1 part of chloroform in 20 parts of rectified spirit.

DOSES.—Horses and cattle, ʒi. to ʒi.ss. ; dogs, ℥xxx. to ℥xl.

Aqua chloroformi—1 of chloroform in 400 of water, or about 1 minim of chloroform to each ounce of water. Used for preserving medicinal solutions and for preparing hypodermic injections, also as a flavouring agent for mixtures.

Tinctura chloroformi et morphinæ—(See p. 246.)

A.C.E. Mixture—Composed of 1 part (90%) alcohol, 2 parts of chloroform, and 3 parts of purified ether.

GENERAL ACTIONS OF CHLOROFORM.

Externally, chloroform acts as a refrigerant. It also depresses the terminations of sensory nerves, and thus acts as a local anæsthetic. If the vapour be confined, or if the drug be applied to the skin with friction, it acts as an irritant; administered by the mouth in an undiluted form, it produces severe irritating effects on the mucous membrane. In small doses, properly diluted, it is *carminative*, *antispasmodic* and *anodyne*.

Chloroform when inhaled enters the blood rapidly, and exerts special effects on the central nervous system. The primary action is *stimulation* of the cerebrum; this is evidenced by excitement and struggling, the degree of which varies with the temperament of the animal, those which are nervous and excitable having this stage prolonged. The respirations are accelerated, and in well-bred horses neighing may occur. The pupils dilate and there are frequent movements of the jaws.

In the horse, the period of excitement will vary according to the method of administration and the temperament of the animal. If the vapour be inhaled with little admixture of air, and if a sufficient amount of the drug be poured on

the sponge, the first stage is usually brief, and anæsthesia is rapidly produced. If, on the other hand, a special form of inhaler be employed and the chloroform vapour be diluted with air, a longer time is taken to induce the stage of anæsthesia.

In the anæsthetic stage consciousness and sensibility are removed and voluntary muscular action is lost ; the functions of the cerebrum are depressed, the general blood-pressure is lowered, and the muscles become relaxed. In deep anæsthesia the corneal reflex is abolished—*i.e.*, there are no longer movements of the eyelids when the cornea is touched.

The degree of anæsthesia varies according to the amount of the drug inhaled, and the period at which the patient is fit for operation will depend on circumstances, the recognition of which requires a practical acquaintance with the subject (see p. 190). As there is a certain amount of depression of the vital nerve-centres present, the important point is to avoid increasing this depression, and by ceasing the administration when a proper degree of anæsthesia is induced, safety to the patient is insured.

If the drug be pushed still further the paralytic stage is reached, the vital nerve-centres in the medulla become paralysed, and there is complete loss of all reflex excitability. The respiratory centre is the first to fail, the respiratory movements become shallow, irregular, weaker, and finally cease.

Experience and experiment have demonstrated that death as the result of chloroform anæsthesia in the horse depends on *paralysis of the respiratory centre*, and that respiration always fails before cardiac action ceases. Experiments in destroying aged and useless horses with chloroform lead us to believe that the horse resists the toxic action of this agent to a far greater extent than the other domestic animals. In many instances large amounts of the drug are requisite, and a long interval of time elapses before death occurs. We notice that at first the respiratory movements become quick and shallow, and that later, when the toxic effects of the drug commence to appear, a long inspiration

may occur, followed by an interval in which no respiratory movements can be observed ; then a series of quick, shallow respirations occur, a longer interval elapses, and respiration finally ceases. The heart beats in a feeble and irregular manner for a short time after respiration ceases.

Other toxic symptoms are the occurrence of convulsive movements of both forelegs prior to death, and in some instances we have observed oral breathing, with great stertor. If the inhalation be conducted with the Carlisle form of inhaler, and little air be admitted, toxic symptoms occur more quickly than if the vapour diluted with air be allowed.

The dog is far more susceptible to the action of chloroform than the horse, and in some instances death occurs with such rapidity that it would seem as if respiration and circulation ceased simultaneously.

THE USES OF CHLOROFORM AS A GENERAL ANÆSTHETIC, WITH REMARKS ON ITS ADMINISTRATION.

As a general anæsthetic, chloroform is the agent selected for the horse. It possesses marked advantages over ether for this purpose, as the latter produces violent struggling and long-continued excitement, and it is only after very large amounts have been administered that anæsthesia can be induced.

In the present day every scientific veterinary surgeon employs chloroform as an anæsthetic when performing operations that are attended by pain. A certain amount of prejudice is still in existence, and trivial objections are raised by those who are ignorant with reference to the safe administration of this agent for surgical purposes. It is quite clear, however, that not only is it our duty to avoid the infliction of pain during operations, but also from a surgical point of view the advantages of having the animal quiescent must be apparent to all. Painful operations performed without anæsthetics are contrary to the dictates of humanity. The struggling induced interferes with the manipulations of the surgeon, is repulsive to the owner or the onlooker, and dangerous to the animal.

Chloroform is also employed in cases where muscular action or spasm has to be overcome, such as in the reduction of herniæ and of dislocations. In some cases of difficult parturition the judicious employment of chloroform is of the greatest assistance in effecting delivery.

In considering the subject of chloroform anæsthesia, the most important point is with reference to the safety of the agent. While a long experience of its use in the horse justifies us in stating that under ordinary circumstances its administration need give rise to no anxiety, still some instances do occur in which alarming symptoms present themselves, and even death has resulted from respiratory failure. We have met with individual idiosyncrasies to the action of this drug, and in certain cases serious symptoms of respiratory distress have manifested themselves, out of all proportion to the quantity of chloroform administered.

Cases often occur in which it is difficult to induce anæsthesia, the preliminary stage being very prolonged, with continued excitement and struggling. In such there is a tendency to push the administration of the drug, and a large amount may enter the system; hence caution is necessary in order to avoid the risk of over-dosage. In these troublesome instances the anæsthetic stage may occur unexpectedly after a long period of excitement. Another possible cause of danger occurs when during a long operation it becomes necessary to repeat the anæsthetic. Here great care should be exercised, so as to obviate the risk of dangerous depression of the vital centres, as there is already an amount of the drug in the system.

If an operation be commenced before a proper degree of anæsthesia is induced there is danger to the patient from the occurrence of shock. This point is of importance, and no operation should be commenced until the stage of excitement has passed off and a state of anæsthesia results.

To start operating before the proper stage usually means that the administration of the drug must be continued at the same time, and there is a danger that the struggling of the animal may not only add to the risks of the action

of the drug, but also a larger amount of the latter may be taken into the system than is desirable or safe. Although the evidence obtained from experiments with chloroform on the healthy horse leads us to the conclusion that this animal resists to a large extent the toxic effects of the drug, we are by no means to infer that the same holds good during the performance of long and severe operations.

In the latter case we know from experience that respiratory difficulties and a serious lowering of blood-pressure are likely to ensue from the operation and to complicate the anæsthesia. This is contrary to the view held by some authorities, who state that during full anæsthesia surgical shock produced no effect on the system. Modern authorities recognise a difference between the condition of ordinary anæsthesia and that complicated by some serious surgical procedure.

According to Dr. F. W. Hewitt (Discussion on Chloroform Anæsthesia, Royal Medical and Chirurgical Society), 'many of the phenomena customarily attributed to the effects of the anæsthetic are in reality referable to the operation. For example, reflex spasmodic retraction of the tongue, reflex laryngeal spasm, reflex general respiratory spasm, might one and all complicate a chloroform anæsthesia, which, in the absence of the particular procedures liable to induce such reflex effects, would have been uneventful.'

This authority gives examples in support of the above, and mentions that 'slight but long-continued laryngeal spasm may be the outcome of prolonged peritoneal manipulation, and this might insidiously bring about an asphyxial state altogether foreign to simple chloroform anæsthesia.' He also states that 'the withdrawal from the abdominal cavity of a portion of intestine during well-established chloroform anæsthesia might be attended by pallor, feeble or arrested pulse, dilatation of the pupil, and in the worst cases separation of the lids and arrested breathing, as the result of cerebral anæmia.'

It is reasonable to believe that cases presenting dangerous

symptoms in the horse, when only a moderate amount of chloroform has been inhaled, may be attributed to reflex respiratory difficulties, complicating the action of the anæsthetic, and arising from the operation itself; but other influences may be present as well (see p. 194).

Judging by the very few fatalities that occur in the horse as the result of chloroform anæsthesia, and considering that it is the exception to employ a skilled assistant for its administration, it is clear that by the exercise of due care and attention every practitioner is justified in adopting its use in surgical work. At the same time we must be prepared for accidents, which may occur even in the most experienced hands.

In the horse it is very rare for dangerous symptoms to arise during the initial administration of chloroform. These are far more likely to occur during the course of a long operation or just after its completion.

Two methods are adopted for the administration of chloroform to the horse. In one very little air is allowed, the pure drug being poured on the sponge contained in the special apparatus. This method has the advantage of shortening the stage of excitement and inducing anæsthesia very rapidly. It has been adopted by many practitioners, and it appears to be safe and effectual. The disadvantages are that during a long operation, when it is necessary to continue the anæsthesia, there is a difficulty in controlling the amount inhaled, and as there is usually a certain amount of the drug in the system already, there is an element of risk in continuing the inhalation in a concentrated form. In the other method the chloroform vapour is diluted with air before inhalation. A special apparatus is employed for this purpose, consisting of a bellows or pump, by which air is driven through a graduated bottle containing chloroform. The diluted vapour is then conveyed by a rubber tube to a capacious nosebag, which is attached to the animal's head. The administration can be regulated by working the bellows either quickly or slowly, and by means of a ventilator at the end of the bag the supply of air can be controlled. The

advantages of this method are that anæsthesia can be kept up for a long time without danger, and the administration can be ceased at any time, and full air admitted without removing the nosebag. The disadvantage is that in some horses the stage of excitement is prolonged, and a considerable interval of time elapses before anæsthesia is produced. This, to a certain extent, can be overcome by lessening the supply of air.

There are a few points of importance in connection with the administration of chloroform to the horse, and to these we shall now direct attention.

Food should be withheld for a reasonable time before operation, so that the stomach may not contain bulky ingesta.

The animal should be cast before administration. To attempt the latter with the horse in the standing position is far too risky to compensate for any advantage gained, as it is the exception for the horse to remain quiet during the preliminary stages.

Care should be taken that there is no impediment to free respiration, such as might ensue from an abnormal position of the animal's head, an ill-fitting halter, or from the manipulations of the attendants when endeavouring to hold the head should struggling occur.

It is prudent to examine the animal's heart before undertaking the administration of chloroform, as, in the event of an accident occurring, such an omission might lead to a charge of neglect.

We may also remark that the owner of an animal should always be informed of the intention to use an anæsthetic, and his consent obtained.

The period of time required to induce the condition of anæsthesia varies according to the temperament of the animal. In a well-bred horse of nervous and excitable disposition and in hard condition, a longer period of time and a larger amount of the drug will be required than in the case of a cart-horse in soft condition. If the stage of excitement seems likely to be unduly prolonged, it is advisable to lessen the supply of air; but during a fit of violent struggling it is

not safe to push the drug, as too large an amount may be inhaled at a time.

The important point is to insure that during the whole period of administration the vapour may be sufficiently diluted, as a sudden change from the dilute to the concentrated form is not safe.

The recognition of the stage of anæsthesia is not always easy. The relaxed condition of the limbs, the absence of the corneal reflex and of struggling when the animal is sharply struck on the quarters, may be accepted as evidence of the anæsthetic stage.

We find that in the horse, under anæsthesia, involuntary or purposeless movements of the limbs may occur when sensitive structures are manipulated or severed. These are easily distinguished from the struggling which is indicative of pain. They are feeble movements, of short duration, and their occurrence does not indicate a further administration of the anæsthetic. It is of the greatest importance to keep the stage of anæsthesia within safe limits, and thus to avoid dangerous depression of the respiratory centre.

The occurrence of alarming symptoms must, in many instances, be attributed to over-dosage, and the difficulties which are mentioned by some practitioners in bringing the animals to a state of consciousness must be ascribed to a similar cause. In all cases our attention should be directed to maintain a safe degree of anæsthesia with the smallest amount possible of the drug.

In the horse, as a rule, the state of the respiration is a reliable guide as to the safety of the animal during anæsthesia, and to this our attention should be directed; but the pulse should also receive attention. Should the respirations tend to become laboured, shallow, or irregular, the apparatus must be immediately removed, the animal's tongue drawn forward, and the head directed towards the open air.

Artificial respiration should be at once resorted to, and our efforts in this direction should not be relaxed even though the respiratory movements may appear to have ceased. A hypodermic injection of from 1 to 2 grains of strychnine

may be administered. This sometimes proves a valuable antidote, but ether is of little, if any, use for the purpose (see p. 193).

In recovering from anæsthesia, it frequently happens that the horse becomes excited while yet unable to co-ordinate his movements, hence it is advisable not to remove the hobbles until consciousness has returned.

It frequently happens that after the operation is completed the animal seems to sink into a secondary stage of anæsthesia, and unless roused this may continue for a lengthened period. This phenomenon probably depends on an excess of the anæsthetic agent which is present in the system; it need not cause alarm so long as the respirations are regular in character, but the patient should be closely watched, as in some instances dangerous symptoms may manifest themselves at this stage.

Another phenomenon which may occur during the commencement of anæsthesia is spasmodic contraction of the extensor muscles of the hind-limbs. This passes off as the administration is continued, and relaxation of the muscles then supervenes.

After the effects of the anæsthetic have disappeared food should be withheld for a few hours. This will prevent the occurrence of colicky pains, which are sometimes met with, especially after the operation of castration in adult horses.

In the dog far more care is necessary in the administration of chloroform than in the horse. A special apparatus should always be employed, as it is of the utmost importance to have the vapour of the drug well diluted with air. It has been proved that with due precautions and proper dilution of its vapour, chloroform anæsthesia can be kept up in the dog with safety. But the occurrence of accidents, in spite of every precaution, has led many practitioners to prefer ether as an anæsthetic in this animal, especially in the case of aged dogs in fat condition. Cases are met with in which respiratory paralysis occurs without any warning, and no measures can prevent a fatal issue.

The safest and most convenient form of chloroform inhaler

for the dog is that invented by Professor Hobday, F.R.C.V.S. London. In this inhaler the chloroform vapour can be properly diluted and a regular administration maintained.

But chloroform has been safely administered to the dog without any special apparatus being employed; a wide-mouthed jar, into which a sponge containing chloroform is placed, being all that is considered necessary by some authorities.

In employing chloroform in canine practice, it is advisable to have a skilled assistant, whose sole duty at the operation should be to administer the anæsthetic and carefully watch the patient.

As in the majority of fatal cases death occurs from respiratory failure, it follows that attention should be specially directed to the respirations, and if these become shallow or irregular, the inhaler should be at once removed and prompt measures taken.

These consist of artificial respiration, which is of first importance; the tongue should be pulled forward and the animal's head kept lower than his body. Even when respiration appears to have ceased our efforts should not be relaxed, as apparently hopeless cases have commenced to breathe again.

Professor Hobday recommends that a few minims of Scheeles' hydrocyanic acid be placed on the back of the animal's tongue by means of a medicine dropper. This causes powerful respiratory effects, and may succeed in starting respiration again.

The inhalation of the vapour of ammonia is employed as an antidote, but its value is doubtful as compared with that of artificial respiration. Similar remarks apply to the employment of ether and strychnine in the form of hypodermic injections. They are useful as adjuncts to artificial respiration, but cannot take the place of the latter when the respiratory powers are failing.

The method of securing the dog during the administration of chloroform is of importance. A proper operating-table is advisable, to which the limbs can be secured in such a manner

that respiration cannot be interfered with during the stage of struggling.

Both in the horse and dog the degree of anæsthesia which is necessary is an important point for consideration. Errors are made in opposite directions: in some cases too little of the anæsthetic is administered, and as a result the proper stage is not reached. In others too deep a stage of anæsthesia is induced, with the result that the operator has an anxious time in bringing his patient back to a state of consciousness, or alarming symptoms may develop, to combat which may be beyond his power.

The corneal reflex is not always a reliable guide in the horse, as slight movements of the eyelids may occur and still a sufficient degree of anæsthesia is present. Practical experience is necessary in order to recognise not only the different stages of chloroform anæsthesia, but also to be aware of variations of its actions in different individuals.

Recently it has been discovered, partly by experiment, partly by clinical observation, that *surgical shock* is responsible for many of the fatalities that occur during chloroform anæsthesia.

In the Hunterian Lectures, delivered by Mr. Lockhart Mummery, F.R.C.S., in 1905, on 'The Physiology and Treatment of Surgical Shock and Collapse' (*vide Lancet*, March 18, 25, and April 1), a vast amount of useful and interesting knowledge is given on this subject.

To those who have administered chloroform to the horse and dog, both experimentally as well as for surgical purposes, it must be apparent that to produce long-continued and deep anæsthesia in a healthy animal is a very different matter from keeping up this condition with safety during a long and severe surgical operation.

It is now recognised that even with an animal fully under the influence of chloroform, when large or important nerve-trunks, or parts richly supplied with nerve-endings, are cut or manipulated, surgical shock may result. This is a condition produced by exhaustion of the vaso-motor centres, the result being a great fall in blood-pressure, the blood

accumulating in the splanchnic vessels. Operations on the abdomen, injury or exposure of the peritoneum, prolonged manipulation of visceral organs, etc., are said to be most frequently followed by shock. Afferent impulses reaching the vaso-motor centres as the result of stimulation of the peripheral nerves at the field of operation are believed to be the chief factors in producing the fall in blood-pressure. Of course, the anæsthetic does much to prevent the occurrence of shock in severe surgical operations, by blocking or minimising the effect of afferent impulses to the central nervous system. The influence of chloroform on the blood-pressure must be remembered—viz., that during the whole period of anæsthesia a fall in blood-pressure occurs.

Ether, on the other hand, causes a rise in the blood-pressure throughout the anæsthesia, and any fall that may occur during an operation is due to the surgical procedure and not to the anæsthetic.

Mr. Lockhart Mummery suggests that in order to minimise shock, a local anæsthetic should be applied to areas which are richly supplied with nerves, or even to the nerve-trunks themselves, before operations are performed on such areas—of course, in addition to a general anæsthetic. Both experimentally and also in actual surgical work it has been proved that by applying cocaine to large nerve-trunks before severing them, no fall of blood-pressure results. He also points out that in the treatment of severe shock occurring during and after operations strychnine is of no value. This was proved experimentally, and it was ascertained that this agent tends to increase and hasten exhaustion of the vaso-motor centre. In lesser degrees of shock the effect of strychnine was more marked, the blood-pressure being rapidly raised. But, as a rule, when the effects of the drug passed off, a relapse into a more severe degree of shock occurred. He concludes that strychnine is not only useless but directly harmful in cases of true shock, and advises instead the intravenous injection of physiological saline solution, also solution of adrenalin (1 to 20,000), in order to raise the blood-pressure. Ergot is also advised for a similar purpose.

Some practitioners advise a hypodermic injection of morphine prior to the administration of chloroform, believing that it lessens the stage of excitement, and that less of the anæsthetic is required. These effects it certainly produces in some cases, but we are of opinion that it tends to increase the risk of fatal depression of the respiratory centre, and hence we cannot recommend its employment.

For the horse, methylated chloroform is safe and economical, but for canine and feline patients the purest chloroform only should be employed. The A.C.E. mixture has been used with success in the dog, but produces too much excitement in the horse. As an antispasmodic and anodyne, the spirit of chloroform is prescribed in cases of gastritis, along with other agents. It is also employed in cases of diarrhœa and dysentery, as an intestinal sedative and astringent. Chloroform enters into the composition of chlorodyne (see p. 246).

ÆTHER (ETHER ; SULPHURIC ETHER).

PREPARED by distilling 1 part of sulphuric acid with 5 parts of rectified spirit.

Æther purificatus—Purified ether.

This is almost free from alcohol and water, and is used for producing general anæsthesia.

Rectified ether—From methylated alcohol.

This is methylated ether which has been washed to free it from methylic ether, then purified and redistilled. It is used for producing general anæsthesia.

DOSES.—Horses, $\bar{3}$ i. to $\bar{3}$ ii.; cattle, $\bar{3}$ ii. to $\bar{3}$ iii.; dogs, \mathfrak{U} xx. to $\bar{5}$ i. Administered, well diluted, with mucilaginous fluids, and repeated as required.

In cases of collapse, where immediate results are desired, the drug is administered hypodermically in one-quarter to one-half the above doses, or may be injected into the muscles.

Spiritus ætheris—Spirit of ether: Ether, 1; alcohol (90 per cent.), 2.

DOSES.—Similar to those of ether.

Absolute ether (Methylated) is prepared for producing

local anæsthesia by spraying, as it is very volatile and is free from water.

Methylated ether is not used for medicinal purposes.

ACTIONS.—*Externally*, ether is a *refrigerant* and a *local anæsthetic*. It evaporates rapidly, abstracts heat, and depresses the sensory nerves of the part to which it is applied. If used in the form of a spray it freezes the skin, and thus removes sensation. If applied with friction, it produces *rubefacient* or *vesicant* effects.

Internally, it stimulates the gastric bloodvessels and nerves, and in a reflex manner stimulates the heart and respiratory system, thus acting as a powerful diffusible stimulant. If inhaled, ether is an anæsthetic, and in some respects resembles chloroform.

The important distinctions are as follows :

(a) Ether has a less depressing effect upon the heart, bloodvessels and respiratory centre than chloroform.

(b) With ether the exciting stage is prolonged, the struggling more marked, the stage of anæsthesia is shorter and less profound, and consciousness is more quickly regained.

(c) Ether must be administered in a concentrated form in order to induce anæsthesia, about 70 per cent. of vapour being necessary in the air inhaled.

Ether increases secretion from the respiratory mucous membrane, and causes a flow of ropy mucus from the mouth. It produces marked acceleration of the respiratory movements, and does not cause paralysis of the vital nerve-centres until large amounts have been inhaled. It raises blood-pressure during the whole period of anæsthesia, thus differing in a marked degree from chloroform (see p. 195).

USES.—As a general anæsthetic ether is of no value in the horse. The violent struggling and excitement which it causes in this animal, and the difficulty of inducing anæsthesia, even when a large amount of the drug has been inhaled, have led to its use being abandoned.

In the dog, however, it proves a safe anæsthetic, and for this reason is preferred by many practitioners to chloroform. In administering ether, its highly inflammable nature

must be remembered, so as to avoid the occurrence of accidents.

The A.C.E. mixture is recommended as an anæsthetic for aged and obese dogs. The use of ether as an anæsthetic is contra-indicated in cases of chronic bronchitis, also in operations in the region of the mouth and throat.

As a *local anæsthetic*, the ether spray has not proved useful in veterinary practice.

As a *diffusible stimulant*, ether may be administered in cases of collapse depending on hæmorrhage or exhausting disease. As its action is evanescent, it requires to be repeated at intervals.

As an *antispasmodic* and *carminative*, it is useful in cases of gastric tympany and gastric impaction in the horse, and is usually combined with other agents in the treatment of such affections.

There are a number of other anæsthetics, such as ethyl chloride, narcotile, and somnoform, but we are not aware of their successful employment in veterinary practice.

COLLODIUM (COLLODION).

This is prepared by dissolving 1 part of pyroxylin or gun-cotton in 36 parts of ether and 12 parts of alcohol.

Flexible collodion is prepared from collodion, Canada turpentine, and castor-oil.

A large number of substances can be dissolved in collodion to form medicated collodions, and the most important of these consist of antiseptics, such as iodoform. These form a protective covering for slight wounds, the usual strength being 1 in 10. They are applied with a fine brush at short intervals, and are especially recommended for laparotomy wounds in the dog, and as a protective covering for wounds of the eyelid in the horse, or in the case of any wound which should heal by first intention.

Mr. H. Gray, M.R.C.V.S., however, prefers ordinary collodion for these purposes, and finds that it causes less irritation and gives better results.

CHAPTER IX

THE CARBON COMPOUNDS (*continued*)

CHLORAL HYDRAS (CHLORAL HYDRATE).

PREPARED by the action of dry chlorine on alcohol. Chloral-alcoholate is formed ; this is decomposed with sulphuric acid, and the chloral thus produced is hydrated.

DOSES.—Horses and cattle, $\bar{3}i.$ to $\bar{3}ii.$; sheep and pigs, $\bar{5}ss.$ to $\bar{5}ii.$; dogs, grs. v. to grs. xx. These doses are repeated at intervals as required, and administered in mucilage or syrup to prevent the irritating effects of the drug on the mouth and pharynx.

INCOMPATIBLES.—Quinine and alkalies.

ACTIONS.—*Externally*, it possesses *antiseptic* properties, and has the power of destroying micro-organisms. In concentrated solution it acts as a *topical irritant*.

Internally, unless well diluted, it causes severe irritation of the mouth and tongue. Chloral is quickly absorbed, and, contrary to what was at one time believed, its composition does not undergo alteration in the blood.

Its specific action is exerted on the nervous system, and in all animals it acts as a powerful *hypnotic*. This effect is brought about in two ways : First, it has a direct action on the brain, lessening the excitability of the cerebral cells. Secondly, it acts indirectly by causing dilatation of the bloodvessels throughout the system, and lessening the force of the heart, thus reducing blood-pressure in the cerebrum.

In *toxic* doses, chloral causes in the horse staggering, relaxation of the muscles, dilatation of the pupils, and, finally, a condition of deep stupor. Some observers record

a brief period of preliminary excitement after a large dose has been administered. In the dog, a toxic dose usually causes a short stage of excitement before producing the condition of stupor.

Chloral depresses the respiratory, cardiac, and vaso-motor centres, causing in large doses irregular, shallow respirations, feeble cardiac action, and general dilatation of the blood-vessels.

ANTIDOTES.—Strong coffee, inhalations of amyl nitrite, hypodermic injection of strychnine, artificial respiration, warmth to surface of body.

MEDICINAL USES.—As an *anodyne*, chloral is largely employed in equine practice. Its action in this respect differs from that of opium, as the latter dulls and arrests sensations of pain from all parts of the body, while chloral prevents the reception of painful impressions by its action on the central nervous system, and does not affect the peripheral nerves.

In the treatment of certain abdominal affections, such as spasmodic colic and colic depending on intestinal impaction, chloral possesses marked advantages over opium and its preparations. While opium in moderate doses may in some cases act as an efficient *anodyne*, it interferes with the normal peristaltic action of the intestines; and in cases of continuous pain, where its repeated use is indicated, it tends to bring about a condition of intestinal paralysis. It also causes extreme nausea; and in instances of violent and continuous pain, ordinary doses fail to give relief, while larger doses repeated at intervals produce exciting instead of *anodyne* effects.

Chloral does not interfere with normal intestinal action. It does not cause nausea; it gives marked relief from pain, and in full doses exerts hypnotic effects. In some cases, where repeated doses have been given, we have observed a laxative effect on the bowels. It can be repeated at intervals in cases of violent or continuous pain, and very little after-effects are observed. It is best administered in solution, and should be well diluted either with milk, mucilage, or treacle, in order to prevent its irritating effects on mucous surfaces.

In the treatment of milk-fever in cows, chloral in the hands of some practitioners gives excellent results, while others find it of little or no value in this respect. The Schmidt form of treatment of this affection, by the injection of antiseptic solutions and air or oxygen into the udder, has proved so universally successful that it has quite superseded all other methods. Nevertheless, in the early stages of this disease, when marked excitement is present, we have found that the administration of 1 ounce of chloral in 1 pound of treacle produces a beneficial effect, and we advocate its employment in conjunction with the Schmidt form of treatment in certain conditions.

In the treatment of meningitis, phrenitis, and all affections characterised by cerebral excitement, chloral in combination with bromides is indicated.

In the convulsions which occur in the secondary stages of azoturia and in uræmic convulsions, chloral gives temporary relief, and should be repeated at intervals.

It has been employed in the treatment of tetanus, but without any degree of success.

In chorea and epilepsy in the dog, chloral with potassium bromide acts as a palliative remedy.

In parturient eclampsia, which is sometimes met with in the bitch, chloral gives good results.

It is an antidote to strychnine poisoning, and is also antagonistic to physostigmine.

Chloral is employed as an anæsthetic by Continental veterinarians. Two or 3 grains of morphine, with $\frac{1}{2}$ grain of atropine, are given hypodermically, and 1 ounce of chloral administered in the form of an enema. The inhalation of a small amount of chloroform is said to complete the anæsthesia. Chloral administered in the food is found to be a safe and effectual agent in the management of vicious horses for shoeing, clipping, etc.

Chloral is *contra-indicated* in cases of organic disease of the heart, in consequence of its depressing effect on this organ.

The following drugs are allied to chloral in their actions: *Butyl chloral hydrate*, *chloralamide*, *paraldehyde*, and *sulphonal*.

They are stated to be less depressant to the heart than chloral, and are prescribed in human medicine as hypnotics, but have no special uses in veterinary practice. Butyl chloral hydrate is said to have a special analgesic effect on the fifth nerve, and hence is prescribed in cases of facial neuralgia in man.

Chloretone is obtained by the interaction of chloroform, acetone, and an alkali. It possesses hypnotic, analgesic, local anæsthetic, and antiseptic actions.

In canine practice it is employed successfully in cases of obstinate vomiting depending on gastritis, or on nervous dyspepsia, etc. From 5 to 10 grains may be given in the form of a powder placed on the back of the tongue. It often succeeds in checking vomiting after every other agent has failed.

Externally, combined with boric acid in the proprietary form of boro-chloretone, it forms a valuable antiseptic dressing for wounds, etc.

Chloretone, if added to solutions of cocaine, is said to render them sterile and active for an indefinite period.

Amyl nitris—Amyl nitrite.

PREPARED by distilling nitrous acid with amylic alcohol.

DOSES.—Horses, ℥ viii. to ℥ xx., administered hypodermically; dogs, ℥ ii. to ℥ v., as an inhalation, and ℥ ss. to ℥ i. by the mouth.

ACTIONS.—Amyl nitrite, if administered by inhalation, enters the system rapidly. It has a special action on the circulatory system; it *dilates* the peripheral bloodvessels by causing relaxation of their muscular walls, the result being that the blood-pressure is lowered to a marked degree. The action of the heart is accelerated, but its force is only slightly increased, and there is a fall in the temperature, due to diminished oxidation.

Toxic doses produce muscular weakness, laboured respirations, loss of reflex excitability, a staggering gait, and finally, death from asphyxia, which may be preceded by convulsions.

Amyl nitrite depresses the motor tracts of the spinal cord, thus reducing reflex excitability. It is believed to have a

special action on the blood, by which it converts a portion of the hæmoglobin into methæmoglobin; the latter not readily parting with oxygen, oxidation is interfered with.

USES.—Amyl nitrite is seldom employed in veterinary practice. As an antidote to chloroform it is of no value. In spasmodic asthma in the dog it is recommended by some practitioners, and experimentally it has proved an antidote to strychnine poisoning. Like many other drugs, it has been tried in the treatment of tetanus, but not with encouraging results. In human medicine it gives marked relief in cases of angina pectoris. This disease is seldom, if ever, met with in veterinary practice, or if it exists, it is rarely diagnosed.

Spiritus ætheris nitrosi—Spirit of nitrous ether; sweet spirit of nitre.

PREPARED by distilling a mixture of rectified spirit, nitric acid, sulphuric acid, and copper, and dissolving the distillate in spirit (90 per cent.).

DOSES.—Horses, ʒi. to ʒiii.; cattle, ʒii. to ʒiv.; sheep and pigs, ʒii. to ʒiv.; dogs, ℥xx. to ʒi.

The smaller doses are those intended to be repeated at intervals. The drug should be properly diluted in order to avoid irritation of the mouth.

INCOMPATIBLES.—Potassium iodide, ferrous sulphate, gallic and tannic acids, antipyrine, and salicylates. When it is desirable to combine potassium iodide with spirit of nitrous ether, some potassium bicarbonate or sodium bicarbonate should be added to the latter in order to neutralise the free acid; this will prevent the separation of iodine, which would otherwise occur. When spirit of nitrous ether is combined with acetate of ammonium in a mixture, the bottle should not be corked for a short time; otherwise, the gas formed may cause the bottle to burst.

ACTIONS.—The spirit of nitrous ether is a *stimulant*, an *anti-spasmodic*, a *diuretic*, a *febrifuge*, and a *carminative*. It accelerates cardiac action, produces dilatation of superficial bloodvessels, lowers arterial pressure, and causes relaxation of involuntary muscles. It acts as a diuretic by dilating the renal bloodvessels, and, by a similar action on the cutaneous

vessels, as well as by stimulating perspiration, it produces diaphoretic effects, but the latter action is seldom observed in animals.

USES.—As a general stimulant, it is extensively employed in veterinary practice, either alone or in combination with alcohol. It is also largely prescribed as a febrifuge, in combination with acetate of ammonium. Although it increases the action of the skin, marked diaphoretic effects are seldom observed in animals, except the action of the drug be assisted by the application of warm clothing to the body.

As an antispasmodic and carminative, it is indicated in cases of spasmodic colic, tympanites, etc.

As a *diuretic*, it is useful in cases of chronic renal affections with increased arterial tension. It causes a free flushing out of the renal tubules and relaxes spasm of the renal vessels. It is contra-indicated in cases of acute nephritis in consequence of its effects on the renal vessels.

In the primary stages of azoturia we have observed good results from the judicious administration of the spirit of nitrous ether, in addition to the other details of treatment (see p. 535).

Formic aldehyde is a gas produced by the limited oxidation of methyl alcohol. It can be condensed by cold to a clear mobile liquid.

Formalin is a solution of formic aldehyde, containing from 35 to 40 per cent. of this gas.

ACTIONS.—In strong solutions it is a powerful *caustic*, also an antiseptic, disinfectant, and deodorant. Its vapour is very irritating to the eyes and respiratory passages, this being due to traces of formic acid.

TOXIC ACTIONS.—Formalin is an irritant poison, producing gastric irritation and consequent collapse.

In carnivora it causes nausea and vomiting, followed by narcosis and coma.

The respirations are greatly accelerated; at first the blood-pressure is increased and the heart's action is rendered slow, these effects probably arising from either direct or indirect stimulation of the medullary centres.

The *antidotes* advised are small amounts of solution of ammonia, well diluted with water, or full doses of liquor ammonii acetatis may be given at frequent intervals. Demulcents are also indicated.

USES.—Formalin is too irritant for use as an antiseptic, but a preparation of it, known as lysoform, is sometimes employed for this purpose (see below).

A 5 per cent. solution has given good results in the treatment of sinuses and fistulæ.

As a disinfectant, other agents are cheaper and quite as efficacious in veterinary practice.

Formalin, diluted with 10 to 50 parts of water, is largely employed for hardening and preserving pathological specimens.

Strong solutions of formalin should not be employed in the treatment of canker in the foot, or as an injection for sinuses, etc., as serious damage to the parts may ensue.

Lysoform, a liquid formaldehyde potash soap. This is a valuable antiseptic agent, and in solutions of 2 to 5 per cent. it possesses high bactericidal action. It may be employed in a 2 per cent. solution for disinfecting the skin prior to operation, for disinfection of the operator's hands and of instruments, and for general surgical purposes.

Amyloform is a compound of formaldehyde with starch. When brought into contact with moist surfaces it gives off formaldehyde gas, and thus exerts antiseptic actions. It has been recommended as a dry antiseptic dressing for wounds, but we have not observed any special advantages that it possesses, and its price is very high for veterinary use.

Glutol is a preparation of formaldehyde and gelatin. It is in the form of a whitish granular insoluble powder. It is used as a surgical dressing, but does not possess any special advantages over cheaper and well-tried agents.

Tannoform, prepared from formaldehyde and tannic acid. It possesses astringent and antiseptic actions.

Internally, it is prescribed in cases of obstinate diarrhœa and dysentery in doses of 1 to 3 drachms for the horse and from $\frac{1}{2}$ to 1 drachm for calves; for the dog, 15 to 30 grains.

Externally, it is employed as a surgical dusting-powder, either alone or with 1 to 4 parts of starch or chalk. It has also been found useful as an application in cases of weeping eczema.

Aminoform—also known as Cystamine, Urotropine, or Formin—is prepared by combining ammonia and formaldehyde. It is employed in human medicine as a urinary antiseptic in cases of cystitis, also as a diuretic and solvent of uric acid concretions.

CHAPTER X

CARBOLIC ACID AND ALLIED AGENTS

ACIDUM CARBOLICUM (PHENOL).

Acidum carbolicum; phenol is in the form of crystals. It is obtained from coal-tar oil by distillation.

Acidum carbolicum liquefactum—Liquefied phenol.

This consists of 10 parts of phenol and 1 part of distilled water, by weight. It crystallises in cold weather.

DOSES.—Horses, ℥xv. to ℥xl.; cattle, ʒss. to ʒi.; sheep and pigs, ℥v. to ℥x.; dogs, ℥i. to ℥ii. It should be properly diluted with water, and if mixed with a little glycerine it is less liable to cause irritation.

For disinfecting purposes varieties of carbolic acid are employed. No. 4 carbolic acid contains 10 per cent. of phenol and nearly 90 per cent. of cresols. 1 in 40 of hot water forms a suitable disinfectant fluid. No. 5 carbolic acid is dark-coloured, and consists chiefly of cresylic acid. It is used for disinfecting buildings, drains, etc.

The pure acid only should be used for medical and surgical purposes.

Glycerinum acidi carbolici — Glycerine of phenol: Phenol, 1; glycerine sufficient to produce 5 (1 in 5).

Unguentum acidi carbolici—Ointment of carbolic acid: Phenol, 1; glycerine (by weight), 3; white paraffin ointment, 21 (1 in 25). The glycerine prevents any portion of the phenol from becoming crystallised, and thus caustic effects are avoided.

Carbolic oil: Phenol, 1; olive-oil, 9. (For dressing scalds and burns, 1 in 20 or 1 in 40 is employed.)

For oiling catheters the following is useful: Phenol, 1; castor-oil, 7; almond-oil, 8.

Carbolic soaps contain from 10 to 20 per cent. of phenol.

Carbolic antiseptic dressings—Carbolic absorbent wool and lint contain from 5 to 10 per cent. of phenol. Carbolic gauze contains 5 per cent. Carbolic tow contains from 5 to 10 per cent.

Carbolic disinfecting powders contain from 20 to 30 per cent. of carbolic acid.

Sodii sulphocarbolas—obtained by dissolving phenol in excess of sulphuric acid, and converting the acid so formed into a sodium salt.

DOSES.—Horses, grs. xl. to ʒii.; dogs, grs. iii. to grs. xv.

Zinci sulphocarbolas—prepared from carbolic acid, sulphuric acid, and oxide of zinc.

ACTIONS OF CARBOLIC ACID.—*Externally*, if applied to the skin in a concentrated form, carbolic acid acts as a *caustic*, producing a *white* eschar, which afterwards becomes of a brown colour. It also produces local anæsthesia of the part to which it is applied. Carbolic acid possesses marked *antiseptic*, *disinfectant*, and *deodorant* actions, a 4 per cent. solution destroying putrefactive and pus-forming organisms, while a 5 per cent. solution is capable of destroying the bacilli of various diseases. It is stated, however, that a 5 per cent. solution failed to destroy anthrax spores after twenty-four hours' exposure.

Internally, carbolic also exerts antiseptic effects, and is frequently prescribed in cases of septic diseases. If used in the form of a medicated inhalation, it acts as a disinfectant to the nasal passages and to the respiratory mucous membrane. In medicinal doses it acts as a gastric and intestinal disinfectant, and arrests excessive fermentation of the ingesta. It can be absorbed from the unbroken skin, also from wounds, mucous surfaces, and subcutaneous tissues.

TOXIC EFFECTS.—In large doses carbolic acid is an irritant poison, and has also special actions on the nervous system. The undiluted acid produces a white, hardened condition of the region of the mouth.

The symptoms observed in the horse are salivation, muscular tremors, a staggering gait, accelerated respirations, coldness of the surface of the body and extremities, convulsions, succeeded by paralysis and coma.

In the dog vomiting and symptoms of intoxication may first appear, succeeded by a state of collapse, death occurring either from respiratory or cardiac paralysis.

On the nervous system carbolic acid has a primary stimulating action. This is succeeded by paralysis of the medulla and spinal cord. On the circulation, after primary stimulation, it acts as a cardiac depressant, and produces a fall in the blood-pressure. The urine assumes a characteristic olive-green or brown colour, and may contain blood.

Cases of carbolic acid poisoning in animals may occur from the use of too strong solutions of the agent as a surgical dressing for wounds or as an application in the treatment of skin diseases.

The dog is specially susceptible to its toxic effects from absorption.

Instances of poisoning have also occurred from this agent being administered by mistake, and fatal cases have occurred in cats when strong carbolic disinfecting powder has been liberally applied to the floors of buildings to which these animals had access, the poison probably entering the system by the animals licking their paws.

The post-mortem appearances of carbolic acid poisoning are patches of inflammation in the stomach and intestines, and if death has occurred within twenty-four hours the characteristic odour of the drug can be detected throughout the body. The kidneys may show inflammatory changes.

One ounce of carbolic acid has proved fatal to the horse, and from 15 minims to 2 drachms to the dog.

The suitable *antidotes* are in the dog emetics, preferably the hypodermic injection of apomorphine. Failing this, sulphate of zinc may be employed. In all animals the sulphate of magnesium or the sulphate of sodium are suitable antidotes, as they convert the poison into sulphocarbolates, which are inert and are excreted by the kidneys.

Sulphate of sodium injected hypodermically is recommended. It must be remembered, however, that sulphate of magnesia should not be used by subcutaneous injection for this purpose, as it acts as a poison. Olive-oil and lime-water should be given freely, also stimulants, to ward off collapse. The hypodermic injection of atropine is also recommended. Other antidotes are saccharate of lime, vinegar, camphorated oil, while recently the oil of turpentine has given good results.

The irritation of the mouth and pharynx should be treated with demulcent drinks and medicated inhalations. The escharotic effects of the drug are said to be best treated by the application of pure alcohol, as solutions of carbolic acid in strong alcohol or concentrated glycerine are not caustic, but assume the latter action when diluted with water.

USES.—*Internally*, carbolic acid is prescribed in cases of pyæmia, septicæmia, septic pneumonia, etc., as an internal antiseptic. It is also employed in combination with other agents in the treatment of dysentery. In flatulent colic in the horse and in tympanites of the rumen in cattle, it is a useful agent for preventing the further formation of gases, arising from fermentation of the ingesta.

The inhalation of steam medicated with carbolic acid gives good results in cases of respiratory affections that tend to assume a septic character, and these inhalations should be employed in conjunction with the internal administration of the drug.

In the treatment of parasitic bronchitis in calves, carbolic acid in doses of 10 minims is prescribed in the form of intratracheal injections; for this purpose it is usually combined with 2-drachm doses of the oil of turpentine, 20 grains of carbonate of potash, and 1 drachm each of olive-oil and water.

In consequence of the susceptibility of the dog to the action of carbolic acid, both internally and externally, we are of opinion that other agents which are far safer and quite as effectual in canine practice should be preferred.

As an antiseptic agent for general surgical work, carbolic acid is still extensively used, but many practitioners prefer to employ some of the many modern antiseptics which are

less toxic and non-irritant. The usual strength of carbolic solutions for surgical purposes is from $2\frac{1}{2}$ to 5 per cent.

Carbolic-oil was at one time a favourite dressing for wounds; but as it possesses very slight antiseptic powers, and as dry dressings give far better results, its use is now discarded. As an application to the uterus in cases of metritis in ewes, it is highly recommended by some practitioners.

Various forms of sheep-dips contain carbolic acid, and prove both safe and effectual.

Sulphocarbonate of soda is occasionally prescribed in cases of flatulence and fermentative dyspepsia in horses, but we have no evidence of any special advantages that it possesses.

Sulphocarbonate of zinc possesses astringent and antiseptic properties. It is recommended as an injection in cases of leucorrhœa in the proportion of 1 drachm to 1 pint of water.

Cyllin was formerly known as 'creolin.' This is a dark liquid prepared from coal-tar, and contains 50 per cent. of a new series of oxidized hydrocarbons, free from phenol and emulsified with neutral tar-oil. It forms a white emulsion with water.

Jeyes' Fluid is a preparation of coal-tar containing 20 per cent. of tricresol saponified with resin and an alkali.

Jeyes' Soluble Fluid forms a clear solution with water, and is stated to be more concentrated than the above preparations.

DOSES OF CYLLIN.—Horses and cattle, $\bar{\text{v}}\text{ii.}$ to $\bar{\text{v}}\text{vi.}$; dogs, ℥i. to ℥x. It should be administered properly diluted, so as to avoid irritation of the mouth and tongue.

ACTIONS.—Both cyllin and Jeyes' Fluid are germicides, antiseptics, deodorants, and parasiticides. Cyllin, being more refined, is preferred for internal use and for canine surgery. Jeyes' Fluid is extensively employed as an antiseptic agent for surgical purposes in horses and cattle, and also as a general disinfectant and deodorant.

Both these agents are said to possess higher germicidal powers than carbolic acid; they are not caustic in their

action, and being far less toxic, they are preferred to carbolic preparations as general antiseptics and disinfectants.

Strong solutions of these agents applied to the skin of dogs or cats produce toxic effects.

Professor Hobday, who has investigated their actions, has arrived at the following conclusions (*Veterinary Record*, October 21, 1905):

‘1. Creolin is a narcotic and irritant poison to the dog and cat, and its use in these animals must be watched with the greatest care.

‘2. It is especially toxic when spread in emulsions of a certain strength over a large area of the body.

‘3. This effect is more rapidly seen and more violent when mixed with water than when applied pure or when mixed in the form of ointment.

‘4. When mixed with water in certain proportions and applied externally, it will act as a violent irritant.

‘5. The less refined preparation of creolin is not so toxic in action as pure creolin.’

The solutions employed were strong: in some instances, equal parts of the agent with water; in others, 2 ounces with 4 ounces of water; but in one instance 1 drachm in 2 ounces of water caused toxic symptoms when applied all over the skin of a collie puppy six weeks old. These, no doubt, are more concentrated than would be used in ordinary practice, but at the same time the experiments teach that only dilute solutions can be used with safety, certainly not stronger than 2 per cent. In small dogs and puppies it is safer to avoid this agent altogether.

The toxic symptoms observed were ‘an unsteady gait (the hind-limbs being particularly affected) and a subnormal temperature. These were followed by complete paralysis, prostration, and clonic spasms of all voluntary muscles, especially those of the limbs, jaws, and eyelids. There was a state of semicoma, followed by complete coma and death from collapse.’

The following antidotes are advised—when the toxic effects are due to the application of an external dressing—‘to wash

the skin thoroughly in hot water containing sulphate of magnesium or sulphate of zinc, whilst diffusible stimulants should be administered internally at frequent intervals, the patient being well wrapped up and put into a warm room. . . .

'Prognosis must be very guarded, as even when an animal has apparently recovered, it is by no means certain that a relapse may not occur.'

Professor Hobday has also found that strong solutions of creolin in the horse as well as in the dog have caused violent irritation of the skin, and dulness, with a subnormal temperature and loss of appetite for several days.*

USES.—Cyllin is prescribed in cases of gastric tympany both in horses and cattle, and is usually combined with other agents. It checks fermentation, and assists in dispelling accumulated gases in the stomach and intestines.

As an internal antiseptic, it is safe and effectual in medicinal doses, and can be administered in all cases of septic diseases.

Externally, as surgical antiseptics, cyllin and Jeyes' Fluid are used, of the strength of from 1 to 2 per cent. solutions in water. In the case of extensive septic wounds this strength may be increased. They are also employed to sterilise instruments, etc.

The soluble fluid is stronger than either of those mentioned, and may be diluted in the proportion of 1 to 200 of water. Forming a clear solution with water, it is preferred as an antiseptic agent for surgical instruments, as it does not obscure them from view in the tray.

In the treatment of parasitic affections of the skin cyllin is largely used, and may be combined with other agents. Care should be taken that it is properly diluted.

As a general disinfectant and deodorant for stables, cow-sheds, kennels, and drains, Jeyes' Fluid is effectual, economical, and safe. Jeyes' Fluid is employed in the treatment of mange or scab in sheep, and dips containing this agent give good results.

* A fatal case of poisoning in the horse by creolin is recorded in the *Veterinary Journal*, February, 1906: 8 ounces of the drug were given by mistake, and death occurred after three days.

The usual strength of solutions for affections of the skin is from 1 to 2 per cent., and glycerine or soft soap may be added with advantage.

Jeyes' Fluid forms an effectual parasiticide for the eradication of lice, ticks, etc., in all classes of animals, but requires to be well diluted with water and used with care in the case of dogs and cats.

Cyllin, combined with boric acid and zinc oxide, forms a dry antiseptic dressing for surgical purposes.

Lysol is a clear brown syrupy liquid, prepared in Germany, and stated to be a solution of tar-oils in neutral soap, and to contain about 50 per cent. of cresols.

ACTIONS AND USES.—Lysol is *antiseptic*, *disinfectant*, and *deodorant*. It is stated to be five times stronger than carbolic acid as a germicide and far less toxic. It is an agent of marked value as a *general antiseptic*, and may be used as a solution of from 1 to 2 per cent. In the treatment of septic wounds and those which are foul and fœtid, we have found lysol superior to many of the other agents in use.

The saponaceous solution which it forms with water is an effectual cleanser and deodoriser, as well as a germicide. We have also found $\frac{1}{2}$ to 1 per cent. solutions of lysol very useful as uterine injections in cases of retained placenta and in septic metritis.

For cleansing and disinfecting the hands contaminated by removing a decomposed placenta or by manipulating parts in a septic condition, lysol, in our experience, has proved superior to the many other agents that have been introduced for this purpose.

Experiments with lysol have proved that 1 per cent. solutions are capable of destroying the parasite which produces parasitic gastritis in cattle, when many of the well-known vermicides have failed to do so.

Lysol is prescribed in combination with other agents as an intratracheal injection in the treatment of parasitic bronchitis in calves, and gives good results. The dose for this purpose is from 10 to 15 minims. Although far less toxic than carbolic acid, precautions should be observed in

administering lysol so as to avoid too large doses, and not to employ too strong solutions for external use, especially in the dog.

We have met with fatal toxic effects in lambs after doses of 2 drachms, administered in the treatment of parasitic gastritis.

Professor Hobday states that in concentrated solutions lysol is equally as toxic as creolin.

Izal is a product distilled from coke, and is supplied in different forms—viz., medical izal, which is an emulsion containing 40 per cent. of izal-oil; izal fluid, which contains 40 per cent. of unrefined oil and is used for disinfecting purposes. Izal is employed as a disinfectant and antiseptic, and is said to be an intestinal disinfectant. Although stated to be non-toxic, Professor Hobday has proved that in concentrated solutions it is an irritant narcotic poison, resembling creolin, but not quite so rapid or violent. The antidotes are similar to those mentioned for the latter.

Traumatol, also known as 'iodo-cresol,' is in the form of a gray amorphous powder, and also as a fluid. It is a compound of cresol and iodine, and is recommended by Continental authorities as a reliable and useful antiseptic. As a surgical dusting-powder, it is combined with chalk in strengths of from 10 to 20 per cent. As it has only been recently introduced into this country, sufficient evidence is not at hand to demonstrate its advantages or otherwise.

Creosotum—Creosote—is obtained from wood-tar. Two varieties of this agent are recognised: one is obtained from pine-wood—it is anhydrous, and consists chiefly of cresol; the other is got chiefly from beech-wood, and should contain 20 per cent. of guaiacol.

DOSES.—Horses, ℥xx. to ʒi.; cattle, ʒss. to ʒii.; dogs, ℥i. to ℥v. It should be administered in an emulsion with mucilage of gum acacia, and given in milk or dissolved in almond-oil. These precautions prevent its irritating effects on the mouth and pharynx.

ACTIONS AND USES.—*Externally*, in undiluted form, creosote is an *irritant* and *caustic*; it stains the skin white and coagulates albumin. It resembles carbolic acid in its

actions, but is stated to be less poisonous, and a more active germicide. It possesses marked antiputrescent and deodorant properties, and checks fermentation.

Toxic doses produce in the dog salivation, vomiting, muscular tremors, laboured respirations, feeble pulse, and in some cases convulsions and coma.

The *antidotes* are similar to those mentioned for carbolic acid (see p. 209).

Creosote is prescribed in obstinate cases of *diarrhœa* and *dysentery*, in combination with other agents. It acts as a *gastro-intestinal disinfectant* and checks fermentation. In some cases of obstinate vomiting in dogs it gives relief, but other agents are preferable. It may be used as an inhalation in cases of septic pneumonia. In the form of intratracheal injection, it is employed in the treatment of parasitic bronchitis in calves in the form of an emulsion, the dose being from 5 to 10 minims.

Externally, it gives good results in the treatment of follicular mange in the dog. Mr. Hunting advises a liniment composed of 4 drachms of creosote, 1 ounce of liq. potassæ, and 7 ounces of olive-oil. This is applied twice a week, and when the parts become tender, longer intervals should be allowed. Before commencing treatment the affected parts should be shaved, as this enables the drug to reach the parasites more readily.

Guaiacol—A liquid obtained from wood creosote. It can also be obtained from guaiacum resin. It resembles creosote in its actions, and in addition is a local anæsthetic and antipyretic. It is not used in veterinary practice.

A variety of medicinal agents of complex composition are included under what is known as the **benzol or benzene series**, of carbon compounds. They are also known as **coal-tar derivatives**. They possess antipyretic and analgesic actions, and many are also antiseptics. Their number is constantly increasing, and, while some possess therapeutical advantages over those drugs already in common use, the value of many of these new remedies is often more imaginary than real. Only a brief notice will be given to those agents whose value has not yet been demonstrated clinically.

Benzol or **Benzene** is a liquid obtained from light coal-tar-oil. It must be distinguished from petroleum benzine or benzoline, which is obtained from American petroleum, and is used for heating thermo-cauteries.

Benzene is an irritant to skin-abraded surfaces and to mucous membranes; it also possesses *antiseptic* and *parasiticide* actions. In large doses it produces toxic effects on the nervous system, evidenced by muscular tremors, loss of sensibility, and convulsions. It is used occasionally in the treatment of parasitic affections of the skin, and also for the destruction of lice, etc. In the horse it can be applied in the undiluted form, but in canine practice it is mixed with 3 parts of oil or vaseline.

Acidum benzoicum—Benzoic acid—is in the form of colourless crystals, and is obtained either from gum benzoin or from toluol. It possesses *antiseptic*, *stimulant*, *antipyretic*, *expectorant*, and *diuretic* actions. Its use is indicated in chronic or subacute inflammation of the bladder, as during its excretion it exerts antiseptic effects on this organ. It is said to render the urine more acid in reaction and to become changed into hippuric acid during its excretion by the kidneys.

Benzoic acid is sometimes prescribed in cases of chronic bronchitis in the dog. The sodium or ammonium salts of this agent are preferred, as they have less tendency to cause irritation of the stomach and intestines. These are recommended in the treatment of acute rheumatism, when salicylic acid or its sodium salt tends to disagree with the patient or fails to produce desired results. The dose of benzoic acid for the horse is from $\mathfrak{z}\text{i}$. to $\mathfrak{z}\text{ii}$., and for the dog grs. v. to grs. x. Sodium benzoate and ammonium benzoate may be given in similar doses.

Benzoic acid is employed in pharmacy to prevent fats becoming rancid, as in adeps benzoatus, which contains 3 parts of benzoic acid to 100 of lard.

Salol—or Phenyl salicylate—is a combination of salicylic acid and phenol; it occurs in the form of colourless crystals. It is an *antipyretic*, an *antiseptic*, and an *intestinal disinfectant*.

Salol is prescribed in cases of diarrhœa depending on excessive fermentation in the intestines, and is said to be the best intestinal antiseptic known. The dose for the horse is from \bar{v} ii. to \bar{v} ss., and for the dog grs. iii. to grs. x., administered in the form of emulsion with almond-oil, gum acacia, syrup and water. If given in too large doses or too often repeated, toxic symptoms may be produced by salol, owing to the phenol contained in it.

Externally, salol has been used as a substitute for iodoform.

Resorcinum—Resorcin—may be prepared by the destructive distillation of Brazil-wood, or by fusing sodium benzene disulphonate with sodium hydroxide; it is in the form of white crystalline plates.

ACTIONS AND USES.—Resorcin is an *antiseptic* and an *antipyretic*, and also an *intestinal disinfectant*. *Externally*, it coagulates albumin and acts as a caustic, but 2 per cent. solutions are non-irritating. *Internally*, it resembles quinine in its specific actions, but produces a very depressing effect on the heart, and its antipyretic action is of short duration.

Toxic doses produce convulsions, insensibility, and paralysis.

Resorcin is seldom employed in veterinary practice in this country. Continental authorities recommend it as an internal antiseptic in the treatment of gastric catarrh and diarrhœa in calves and foals, the dose being from 30 to 60 grains. Externally, it is stated to prove of value in the treatment of the seborrhœal type of eczema in the dog, and may be combined with zinc oxide, as in the following ointment: Resorcin, 1; glycerine, 1; zinc oxide, 1; white paraffin ointment, 6.

Pyoktanin is a chemical preparation belonging to the class of aniline colours. It occurs in two forms—viz.: pyoktanin cœruleum, or methyl violet; pyoktanin aureum, or auramin, which is of a yellow colour. Methyl violet is the form generally employed. It is stated to possess marked germicidal actions, and to be non-toxic and non-irritating. In the proportion of 1 to 1,000 of water it penetrates living textures rapidly, causing a violet coloration of the tissues.

Some authorities state that it has only slight antiseptic

power and has no effect on suppuration. Continental authorities recommend it in the treatment of suppurating ulcers, the undiluted powder being applied to the affected parts. It is also recommended in the treatment of conjunctivitis and in ulceration of the cornea, the strength employed being 1 to 1,000. It is said to have given good results in the treatment of malignant tumours, a 1 per cent. solution being injected deeply into the base and substance of the growths.

Methylene blue—an aniline derivative—possesses analgesic and antiseptic actions. It is recommended by Continental authorities as an efficient application to the ulcers of stomatitis.

Naphthalinum—Naphthalene; naphthalin—a hydrocarbon obtained from coal-tar, occurring in the form of white crystalline plates. It is an antiseptic and a parasiticide, and is stated to have a special action on the intestinal mucous membrane.

It may be prescribed as an *intestinal antiseptic* in cases of diarrhoea and dysentery, and also as a vermicide.

DOSES.—Horses, $\overline{\text{ʒ}}$ i. to $\overline{\text{ʒ}}$ ii.; dogs, grs. ii. to grs. v. Administered in the form of bolus or pill.

Externally, naphthalene may be used as an antiseptic dressing for wounds and ulcers. As a parasiticide in the treatment of scabies, a 10 per cent. solution in olive-oil is employed.

Naphthol occurs in white shining crystals, and is obtained by a complex process from naphthalene. Two forms of this agent are recognised—viz., alpha-naphthol, or α -naphthol; beta-naphthol, or β -naphthol. Both forms are antiseptics and parasitocides. Alpha-naphthol is said to possess greater antiseptic powers than the other form, and also to be less toxic; but the latter is usually prescribed.

It is occasionally used as a vermifuge and as an intestinal antiseptic, the dose for the horse being from $\overline{\text{ʒ}}$ i.ss. to $\overline{\text{ʒ}}$ ii., and for the dog from grs. iii. to grs. x. Administered in the form of emulsion.

Externally, it is employed in the treatment of scabies,

eczema, and psoriasis in the form of ointment—*e.g.*, 1 to 8 of prepared lard or lanolin.

Phenacetinum—Phenacetin—a white crystalline powder, prepared by the action of glacial acetic acid on paraphenetidin. It is an *analgesic*, an *antipyretic*, and a *nerve sedative*.

It is stated by authorities to be less depressing to the heart than antipyrine or antifebrin, two agents which resemble it in their antipyretic actions, hence it is regarded as a safer drug. Its antipyretic action is more prolonged than the above. It may be prescribed in cases of influenza, with high temperature, in the horse, in doses of from $\mathfrak{z}\text{ii}$. to $\mathfrak{z}\text{ss}$, and repeated at intervals. In cases of canine distemper, phenacetin in doses of from grs. iii. to grs. x. is prescribed by some practitioners. In order to prevent any depressing effects, it may be combined with grs. ii. of citrate of caffeine.

In our experience, quinine is far more reliable in both horses and dogs than phenacetin or allied substances, but quinine and phenacetin may be combined with advantage.

Phenazonum—Phenazone; antipyrine—occurs in white crystalline scales or powder, and is another coal-tar derivative of complex composition. It possesses *antiseptic*, *antipyretic*, *analgesic*, and *hemostatic* actions. It is also said to be a uterine sedative.

In febrile cases it reduces abnormal temperature very quickly, but unless the doses are repeated pyrexia recurs. Its action in this respect is believed to depend on diminished production of heat, on less oxygen being taken into the system, and on dilatation of the cutaneous vessels. In consequence of its depressing action on the heart, it is *contraindicated* in cases of cardiac weakness and in extreme exhaustion. In all cases administration should be commenced with moderate doses, and the effects watched.

Toxic doses produce in the dog vomiting, gastro-intestinal irritation, feeble pulse, muscular weakness, convulsions, and paralysis. Antipyrine is not often prescribed in veterinary practice, as quinine is found to be more reliable as an antipyretic. It may be employed in cases of influenza, characterised by very high temperature.

DOSES.—For the horse, $\bar{\text{v}}\text{ii}$. to $\bar{\text{v}}\text{ss}$. ; for the dog, grs. v. to grs. xv.

It is incompatible with spiritus ætheris nitrosi.

As a hæmostatic, a 10 per cent. solution may be employed locally in cases of epistaxis or hæmorrhage from the nose.

Acetanilidum—Acetanilide ; antifebrin. This is a crystalline substance, prepared by the action of glacial acetic acid on aniline. It is a powerful *antipyretic*, and also possesses *analgesic* and *diuretic* actions, but it is a feeble antiseptic.

Its actions and uses resemble those of antipyrine, and its advantages over the latter are said to be as follows : a steadier and more prolonged action as an antipyretic, less danger of collapse, and a smaller dose. Some authorities, however, state that it is less safe and less constant in its action than antipyrine.

The dose is about one-fifth that of antipyrine. Thus for the horse it would average from $\bar{\text{v}}\text{ss}$. to $\bar{\text{v}}\text{i}$. ; and for the dog, gr. i. to grs. iii. It is safer to commence with the minimum doses, and to watch the effects produced, so as to avoid any risk of cardiac depression. It may be administered in the form of powder or dissolved in weak spirit.

Antifebrin in *toxic* doses produces in the dog vomiting, nausea, and purging, a weak, thready pulse, laboured respirations, convulsive movements, and collapse. In human beings it is said to occasionally induce unexpected toxic effects if full doses are taken.

Piperazine is allied to benzene, and is produced by the action of ammonia on ethylene bromide or chloride. It is said to have a powerful solvent action on uric acid. We have no evidence of its utility in veterinary practice.

Acetozone, or benzoyl-acetyl-peroxide, is a proprietary preparation, crystalline in form, and is said to possess marked antiseptic powers. It is decomposed by contact with alkalies and organic matter of all kinds ; and in the presence of water it undergoes hydrolysis and decomposes, this action being necessary to develop its full germicidal activity.

For use, both internally and externally, it is advised to

add 25 grains of acetozone to a quart of pure water, and to shake thoroughly. A hazy solution results from the suspended absorbent powder and from the benzoic acid resulting from the decomposition. It is stated that acetozone is non-toxic, and in properly diluted solutions it is non-irritating to the skin or mucous membranes.

We have not sufficient experience of this agent to give an opinion on its utility, but it should prove valuable as an internal antiseptic in canine practice, and also as a surgical dressing. The solution may be administered to the dog in doses of from 1 to 2 ounces three times a day.

As a surgical dusting-powder, acetozone may be diluted with 100 parts of boric acid.

An ointment may be prepared with 1 part of acetozone to 5 parts of vaseline. The agent is far too expensive for equine practice, as at present its cost is £1 4s. per ounce.

Experiments have demonstrated that acetozone possesses powerful germicidal actions as compared with other antiseptic agents in use.

It is recommended that the solution should be freshly prepared for use, as after forty-eight hours it deteriorates in activity.

Hydrogenii Peroxidi Liquor—Solution of Hydrogen Peroxide. This forms the active ingredient in the disinfectant known as 'Sanitas.'

Hydrogen Peroxide is occasionally employed in veterinary practice as an antiseptic; it also possesses local astringent actions.

Chinosol is the potassium salt of a compound of oxy-chinoline and sulphuric acid. It occurs in the form of a yellow minutely-crystalline powder, which is readily soluble in water. It is not affected by albumin, but is precipitated by alkalies.

Chinosol is a powerful *antiseptic*, *disinfectant*, and *deodorant*. When it comes into contact with the alkaline secretions of wounds oxychinoline is said to be set free, which acts as an oxidiser and disinfectant.

Experiments have demonstrated that chinosol possesses

marked germicidal powers, a 1 per cent. solution destroying anthrax spores, and a 5 per cent. destroying staphylococci.

A solution containing 15 grains to the pint is said to be as effectual as a 1 in 40 solution of phenol.

The actions and toxic effects of chinisol have been investigated by Professor F. Hobday (*Journal of Comparative Pathology and Therapeutics*, March, 1898). The conclusions he arrived at were as follows: The cat was susceptible to its actions, both from application of solutions to the skin as well as from administration by the mouth. It is not rapidly absorbed from the unbroken skin of the dog. The toxic symptoms observed were 'sneezing, coughing, a flow of ropy saliva from the mouth, a subnormal temperature, staggering gait, loss of motor power, commencing in the hind extremities, prostration, and death from cardiac failure.'

Solutions of the drug were found more active than the dry form. The undiluted dry powder caused pain and irritation when applied to a wound. Except in weak solutions, if injected subcutaneously it produces local irritation and swelling. The strength found most useful for surgical purposes is from $\frac{1}{2}$ grain to 1 grain to the ounce of water.

Chinisol is largely employed as a general antiseptic in veterinary practice, and some practitioners prefer it to any other agent for this purpose. As a dry dressing, it may be combined with boric acid or zinc oxide. With ordinary precautions, it is a safe antiseptic in canine practice.

In the treatment of milk-fever, chinisol, in the proportion of 8 to 15 grains to the pint of water, forms a safe and effectual injection for the udder, and is far preferable to iodide of potassium for this purpose. Half a pint of a solution of the above strength is injected into each quarter, and this may be followed up with the injection of air.

Orthoform. — A white crystalline powder of complex chemical composition. Technically it is known as 'methyl ester of para-amido-meta-oxy-benzoic acid.'

Orthoform, New, is now generally used, and is the methyl ester of meta-amido-para-oxy-benzoic acid.

Orthoform is a *local anæsthetic* and also an *antiseptic*. It is non-irritating, and is not absorbed from unbroken skin.

Large doses given by the mouth or by hypodermic injection to the dog produce nausea, vomiting, and marked nervous depression. A 1 in 10 solution of orthoform in collodion is employed in canine practice as a protective covering for simple wounds. In the treatment of burns and ulcers, orthoform may be applied in the form of a dusting-powder.

In equine practice, orthoform is far too expensive for general use, and possesses no special advantages over other agents for surgical purposes.

A large number of coal-tar derivatives, besides those already mentioned, have been introduced from time to time; but they do not merit our attention, as their therapeutical value has not been clinically demonstrated in veterinary practice. Agents, such as chinoline, thallin, kairine, exalgin, etc., have been tried as antiseptics and antipyretics, but they do not possess any special advantages.

Liquor picis carbonis—Solution of coal-tar.

Liquor carbonis detergens.—This is an alcoholic solution of coal-tar. It is said to owe its properties in part to phenol.

These agents, diluted with 20 parts of water, are occasionally used as local applications in the treatment of skin affections in horses and cattle.

Iodoformum—Iodoform—is prepared by acting on alcohol with iodine in the presence of caustic potash. Two forms are recognised—viz. :

Iodoformi pulvis.—This is in the form of very minute crystals, which do not tend to agglomerate.

Iodoformum præcipitatum—Precipitated iodoform—is in the form of an impalpable powder. It has a slight tendency to agglomerate, which interferes with its use as a dry dressing for wounds.

INCOMPATIBLES.—Iodoform is incompatible with calomel.

Collodium cum iodoformo—Iodoform collodion: Iodo-

form, 1; flexible collodion, 9. Used as a protective covering for wounds.

Unguentum iodoformi—Iodoform, 1; yellow paraffin ointment, 9.

Iodoform gauze contains 10 to 20 per cent. of iodoform. Iodoform wool contains 10 per cent. of iodoform.

ACTIONS AND USES.—Iodoform is an *antiseptic*, a *deodorant*, and a *local anæsthetic*. According to some authorities, it is a feeble germicide and not fatal to bacteria, but it acts on their products, rendering the latter harmless. When in contact with wounds liberation of free iodine occurs, and on this its antiseptic action is believed to depend.

Although containing 96 per cent. of iodine, iodoform does not act as an irritant, either given internally or applied topically.

When applied to wounds, abrasions of the skin, and ulcers, it exerts slight local anæsthetic actions. Constitutional symptoms are seldom observed in animals as the result of absorption of iodoform from surgical dressings.

In the dog, however, care is necessary in order to prevent the animal from licking parts which have been dressed with this agent. The toxic symptoms which have been observed in the dog as the result of the ingestion of iodoform are vomiting, drowsiness, muscular tremors, cardiac depression, and if continued for some time, emaciation occurs.

Iodoform is not used internally in veterinary practice. Its chief use is in the treatment of wounds that have assumed a septic character, or in those in which it is impossible to have antiseptic measures adopted, such as are met with in country practice. It may be applied in the form of a dusting-powder, either undiluted or combined with boric acid. In consequence of its tendency to promote excessive granulations in wounds, other agents are preferred to iodoform for general surgical purposes.

In the treatment of nasal gleet, after surgical measures have been adopted, the application of iodoform to the interior of the affected air sinuses gives good results.

A combination of iodoform, zinc oxide, and boric acid

forms one of the best applications for the treatment of moist *caner of the ear* in the dog. A similar combination is of value as a dry dressing for *fissured heels* in the horse, the result of grease.

In cases of that affection of the horse's foot known as *thrush*, equal parts of iodoform and calomel form an efficient dressing; and although the combination is incompatible, it proves useful. In spite of the large number of substitutes for iodoform that have been introduced from time to time, we have not found any that can replace it in the treatment of unhealthy wounds, ulcers, etc.

A useful antiseptic ointment is prepared with: Iodoform, 1 part; boric acid, 1 part; oil of eucalyptus, 1 part; vaseline and lanolin, of each 4 parts.

Iodoform collodion is employed as a protective covering to small wounds and to operation wounds, as it assists healing by first intention (see p. 198).

In the treatment of septic metritis, some practitioners, after thoroughly flushing out the uterus, advise the application of a 1 in 4 iodoform ointment to the interior of the organ.

Aristol—prepared by mixing a solution of iodine in potassium iodide with an alkaline thymol solution. It contains 46.2 per cent. of iodine, and is said to be non-toxic. It is recommended for the treatment of burns and scalds, also as a dusting-powder, combined with starch, etc., for wounds.

Several substances have been suggested as substitutes for iodoform, such as iodol, euophen, loretin, losophan, iodoformal, iodoformin, etc. They all contain iodine in varying amount, but do not possess sufficient advantages over iodoform to merit special attention.

Ichthyol—Ammonium sulpho-ichthyolate—is a viscid brown liquid obtained by heating the products of distillation of a bituminous quartz found in the Tyrol, with sulphuric acid, and neutralising with ammonia. The deposit from which this substance is obtained is believed to be the fossil remains of fish and other animals.

Ichthyol is a *local vascular sedative*, a *parasiticide*, and an *antiseptic*. If applied to a raw surface or to an inflamed skin, it causes at first a sensation of smarting ; this is succeeded by a feeble local anæsthetic and astringent action.

Ichthyol is recommended by Continental authorities as an efficient application in the treatment of chronic affections of the skin, such as eczema and psoriasis. It is advised in the treatment of parasitic skin affections, also as a local application in erysipelas and in rheumatism affecting joints. For these purposes it is employed in the form of ointment, the strength of which may vary from 10 to 50 per cent., the basis being lanolin.

Thiol, a substance prepared by heating gas-oil with sulphur, resembles ichthyol in its composition and properties, and is recommended for similar purposes.

PARAFFINA (PARAFFINS).

These are arranged according to their consistency, as follows :

Paraffinum durum—Hard paraffin ; paraffin wax.

This is usually obtained by distillation from shale. It melts at 130° to 135° F. When sterilised, and having a melting-point between 110° and 115° F., it is employed in human surgery in plastic operations, being injected subcutaneously. A special rubber-covered syringe is used for this purpose to prevent the material cooling during injection. It is also used in the form of a submucous peri-rectal injection in the treatment of prolapsus ani. About 17 minims are injected into the part every ten seconds, until desired results are obtained. Professor Hobday has found it useful in cases of the latter affection occurring in canine practice.

Paraffinum molle—Soft paraffin.

This consists of some of the softer or more fluid members of the paraffin series of hydrocarbons, obtained by purifying the less volatile portions of petroleum. It is also known as vaselinum or vaseline. When soft paraffin is repeatedly filtered through animal charcoal it becomes white in appear-

ance; hence there occur two forms of soft paraffin—viz., the *yellow* and the *white*. Similar forms of vaseline are recognised.

A variety of compounds resembling vaseline are manufactured, such as adepsine, chrisma, cosmoline, cremontine, petroleum jelly, etc.

Vaseline, or soft paraffin, is unirritating to the skin and mucous membranes. It does not oxidise or become rancid, and thus is preferred to lard as a basis for ointments. It is not readily absorbed, and hence is employed as a basis for agents intended to have a surface action on the skin. Vaseline, medicated with antiseptic agents, is employed as a lubricant for surgical instruments.

Unguentum paraffini—Paraffin ointment.

PREPARED with hard paraffin, 3 parts; soft paraffin (either yellow or white), 7 parts.

When used as a basis for white ointments the white variety of soft paraffin is employed. Paraffin ointment, being firmer in consistence than soft paraffin, is used in the preparation of many ointments.

White vaseline-oil, also known as liquid vaseline, is a semi-liquid mixture of paraffins of low melting-point. It is a form of paraffinum liquidum, or liquid paraffin, and is used as a basis for applications to the skin in long-haired dogs.

Petroleum benzine, must be carefully distinguished from benzene, which is a product of coal-tar (see p. 217). It is an irritant to the skin if applied undiluted, and is also a germicide.

Paraffin-oil, or lamp paraffin, if applied with friction, acts as a counter-irritant. Diluted with olive-oil, it is sometimes used as a dressing for follicular mange in the dog, and is said to prove effectual. For this purpose the refined paraffin-oil should be employed.

An instance of slow poisoning from paraffin-oil is recorded by the late Professor Williams ('Principles and Practice of Veterinary Medicine'). This occurred in several cattle, the source of the poisoning being the refuse of paraffin works, which gained access to the stream supplying the animals

with water. The symptoms observed were gradual loss of flesh and persistent diarrhœa. The post-mortem appearances were anæmia, wasting of the muscles, a grayish-black appearance of the intestines, and the presence of dull dark-gray or blackish spots therein. The mesenteric glands were enlarged, and both these as well as the lacteals were found to contain paraffin. The chief action of the agent seemed to be exerted on these glands, as the power of absorption was lost, the chyle vessels being rendered impermeable by the paraffin.

A point worthy of note is that some of the affected animals had ceased to have access to this stream for some months, and still the characteristic smell of paraffin was present in the organs of the body on post-mortem examination.

The antidote advised for paraffin-oil-poisoning is the free use of stimulants, and in the dog emetics should be given in the early stages.

Paraffin-oil, in combination with other oils and a solution of soap, forms an efficient dressing for cases of parasitic mange in the horse. It is also employed in the treatment of ringworm.

CHAPTER XI

HYDROCYANIC ACID

Acidum hydrocyanicum dilutum (B.P.), (Diluted hydrocyanic acid ; Prussic acid).

PREPARED by distilling aqueous solutions of ferrocyanide of potassium and sulphuric acid, and diluting the product with water to the definite strength (British Pharmacopœia). This is a liquid containing 2 per cent. by weight of anhydrous hydrocyanic acid (hydrogen cyanide).

Acidum hydrocyanicum (Scheele).—This contains 4 per cent. of anhydrous hydrocyanic acid.

DOSES.—Of the dilute acid : Horses and cattle, ℥xx. to ℥i.; sheep, ℥x. to ℥xv.; dogs, ℥ii. to ℥v. The doses of Scheele's acid are one-half of the above.

INCOMPATIBLES.—Silver, copper and iron salts, and mercuric oxide.

ACTIONS.—*Externally*, it acts as a local anæsthetic by depressing or paralysing the superficial sensory nerves. If applied over a large area of skin, it can be absorbed and produces toxic effects.

Internally, in medicinal doses it acts as a sedative to the gastric nerves. It enters the blood rapidly, and in toxic doses it is believed to combine with the hæmoglobin, and to arrest the oxidising function of the red blood-corpuscles. Experiments show that the venous blood becomes altered to the appearance of arterial, and finally turns a deep black colour.

TOXIC ACTIONS.—Hydrocyanic acid is one of the quickest and most fatal poisons.

In the dog a dose of from 40 to 60 minims may cause death

almost instantaneously by paralysis of both the cardiac and respiratory centres. Usually, however, death occurs from asphyxia.

The drug, being very diffusible and volatile, is quickly absorbed. Immediately after administration the animal makes a few quick inspirations, utters a suppressed cry, falls in convulsions, and death occurs in from two to three minutes from respiratory arrest; the heart continues to beat for several minutes after respiration has ceased. In other instances death does not occur so rapidly, and the symptoms observed are dilatation of the pupils, impaired voluntary movement, weakness of the pulse, and tetanic convulsions.

Horses are not so susceptible to the medicinal acid, and in some experiments 3-drachm doses were taken without causing death.

The anhydrous acid, administered hypodermically in doses of from 10 to 20 minims, has caused death in from one to two minutes. Doses of from 4 to 5 drachms given by the mouth have caused death in about an hour in the horse.

The specific action of hydrocyanic acid is exerted on the central nervous system. The respiratory centre is briefly excited and then paralysed, causing convulsions and asphyxia. The cardiac and vaso-motor centres are first depressed and then paralysed, resulting in a marked fall in the blood-pressure and feeble cardiac action; the nervo-muscular structures of the heart itself are depressed at the same time. The cerebrum and spinal cord are also depressed and finally paralysed, the results being tonic and clonic convulsions, succeeded by coma and paralysis of the voluntary muscles.

The *post-mortem* appearances are not constant. In cases where death has been instantaneous the blood throughout the body is found of an arterial hue, and remains fluid for some hours. When death has occurred from paralysis of the respiratory centre, the usual appearances of asphyxia will be present. If the autopsy is held within a short time after death, the characteristic odour of the drug will be evolved from the body.

ANTIDOTES.—Artificial respiration constitutes the most

important means of treatment, but to be successful it must be carried out immediately after the poison has been taken. The subcutaneous injection of ether is also indicated. The other antidotes suggested are the hypodermic injection of atropine, in order to stimulate the cardiac and respiratory centres, the inhalation of the vapour of ammonia, the inhalation of oxygen, and the use of the hot and cold douche alternately over the head and neck.

The chemical antidote recommended is the administration of a ferric and ferrous salt, combined with magnesia or potassium carbonate. Oxide of iron freshly precipitated with magnesia is also advised; but obviously, with such a rapidly acting poison, chemical antidotes prove of little or no avail.

USES.—As a *gastric sedative*, hydrocyanic acid is prescribed in cases of gastritis in the dog. It lessens the irritability of the gastric nerves, arrests vomiting, and relieves pain. In such cases it may be prescribed with bismuth in an alkaline mixture. In obstinate vomiting, depending on any cause, hydrocyanic acid often succeeds in checking this troublesome symptom when other agents fail. It is occasionally prescribed to allay the dry, irritable cough of asthma, but other drugs are safer and quite as effectual. It should be administered in minimum doses at first, and repeated at intervals, the effects being closely watched.

As an efficient antidote to chloroform in the dog, Professor Hobday recommends that a full medicinal dose of hydrocyanic acid be placed on the back of the tongue by means of a drop-tube. He prefers Scheele's acid for this purpose, in consequence of its quicker action, and the dose recommended is $\frac{1}{8}$ minim for each pound of body-weight. He believes that it produces beneficial results by its primary stimulation of the respiratory centre; that it maintains the respiratory efforts, and, by the deep inspirations produced, it enables a full amount of fresh air to enter the system. Of course, artificial respiration is to be carried out at the same time.

Hydrocyanic acid is occasionally prescribed along with other agents in the treatment of parasitic bronchitis in

calves, and may be added to the solution for intratracheal injection in doses of 5 minims. It assists in destroying the parasites, and relieves the cough by allaying bronchial irritation.

Hydrocyanic acid has been recommended in the treatment of tetanus, but the results obtained are not more encouraging than those from other agents. It also forms one of the constituents of chlorodyne (see p. 246).

Externally, hydrocyanic acid is employed in the form of a lotion to allay excessive itching of the skin in horses. One drachm of the dilute acid may be combined with $1\frac{1}{2}$ ounces of glycerine and a pint of water. This must be applied with caution.

CHAPTER XII

THE VEGETABLE KINGDOM

Aconite.

Aconiti radix—Aconite root.

The dried root of *Aconitum napellus* (monk's-hood).

Aconiti folia—Aconite leaves.

The fresh leaves and flowering tops of *Aconitum napellus*.

Pulvis aconiti folia—Powdered aconite leaves.

DOSE.—Horses, $\bar{5}i.$ to $\bar{5}i.ss.$

Tinctura aconiti (British Pharmacopœia)—Tincture of aconite.

One part of dried aconite root in 20 parts of alcohol (1 in 20).

DOSES.—Horses, $\bar{5}i.$ to $\bar{5}ii.$; cattle, $\bar{5}ii.$; sheep and pigs, $\mathfrak{M}x.$ to $\mathfrak{M}xx.$; dogs, $\mathfrak{M}iii.$ to $\mathfrak{M}x.$

Fleming's tincture of aconite is about twelve times as strong as the above.

DOSES.—Horses, $\mathfrak{M}v.$ to $\mathfrak{M}x.$; cattle, $\mathfrak{M}x.$; sheep and pigs, $\mathfrak{M}ii.$ to $\mathfrak{M}iii.$; dogs, $\mathfrak{M}ss.$ to $\mathfrak{M}ii.$

Linimentum aconiti—Liniment of aconite.

One part of aconite root in $1\frac{1}{2}$ parts of alcohol, with 1 part of camphor.

Linimentum aconiti compositum — A.B.C. liniment. Aconite liniment, belladonna liniment, chloroform liniment, equal parts.

Aconitina—Aconitine. An alkaloid obtained from aconite root.

Unguentum aconitinæ—Aconitine ointment.

Aconitine 1 part, oleic acid (by weight) 8 parts, lard 41 parts.

ACTIONS OF ACONITE.—*Externally*, aconite if applied to the skin or mucous membranes depresses and subsequently paralyses the peripheral endings of sensory nerves, and thus removes sensation from the part. It can be absorbed from the skin, more especially if the latter be abraded, and may produce constitutional effects.

Internally, aconite is rapidly absorbed from the stomach, and enters the tissues quickly from the blood. It possesses anodyne, sedative, antipyretic, diaphoretic, and diuretic actions. Small doses repeated at intervals lessen the frequency, force, and tension of the pulse, lower blood-pressure, and reduce temperature.

The exact mode by which aconite influences cardiac action is not understood. Some authorities believe that the slowness of pulse induced is due to some action of the drug on the roots of the vagus. The secretions of the skin and salivary glands are increased, and the flow of urine is augmented both in solids and fluids.

TOXIC ACTIONS.—Aconite exerts its actions most markedly on the peripheral ends of sensory nerves, on the heart, respiration, medulla, and spinal cord. The primary effect of the drug is irritation of the stomach, evidenced in the dog by violent vomiting and continuous retching. On the heart, the primary effect is to cause a slow pulse, but the latter soon becomes frequent, irregular, and feeble, as the motor ganglia in the heart and the roots of the vagus become paralysed.

On respiration, the effect is that of depression; the respirations are at first slow and deep, but soon become shallow and laboured. The respiratory centre becomes paralysed, and death usually occurs from asphyxia; but a very large dose may kill by syncope, depending on sudden paralysis of the cardiac muscle. Convulsions may precede death, and probably depend on indirect effects through the circulation.

On the nervous system, the specific action of aconite is that of paralysis, both of the vital nerve-centres and of the spinal cord. The vaso-motor and respiratory centres are paralysed, the reflex power of the spinal cord is lost, the sensory ganglia being affected before the motor ganglia.

It is believed that the paralysis of the spinal cord depends to a certain extent on imperfect nutrition, due to interference with the blood-supply to this structure. The cerebrum is not directly affected, so that consciousness is not removed, but it may be indirectly acted on through the circulation.

In the horse the toxic dose of tincture of aconite is variable. In one instance, recorded by Colonel F. Smith, A.V.D., 4 ounces given to a pony, although causing alarming symptoms, did not prove fatal. The usual symptoms observed are salivation, champing of the jaws, frequent attempts at swallowing, a weak and very compressible pulse, regurgitation of air and fluid from the nostrils, sweating, pallid mucous membranes, muscular twitching, shallow, irregular breathing, and frequent attempts at vomition. In some instances evidences of irritation of the stomach and intestines are present, consisting of nausea, colicky pains, and diarrhœa, and in the later stages paralysis of the limbs occurs.

Cattle are less susceptible to the action of the drug, and take far larger doses without exhibiting toxic symptoms.

Dogs are very susceptible, and in some instances recorded 1 drachm of Fleming's tincture caused death in thirty minutes. The symptoms observed are violent vomiting, retching, salivation, muscular weakness, and paralysis of the posterior extremities. The toxic dose is variable.

The *post-mortem* appearances recorded are the presence of frothy mucus in the trachea and bronchi, the lungs collapsed and anæmic, the right side of the heart distended with blood, and the left side empty.

Aconitine is a very active poison, a dose of $\frac{1}{10}$ grain inducing toxic symptoms in the horse in a few minutes. The prominent symptoms observed in fatal cases are salivation, grinding of the teeth, abdominal pain, and tetanic convulsions.

ANTIDOTES.—In the dog, if seen immediately after the drug has been taken, emetics should be administered without delay. The most effectual is apomorphine, given hypodermically, the dose being $\frac{1}{15}$ to $\frac{1}{10}$ grain.

Stimulants, such as alcohol and ammonia, are indicated;

but as there is usually difficulty in swallowing, the hypodermic injection of ether is best.

Atropine is recommended in the form of hypodermic injection—for the dog $\frac{1}{30}$ grain, and for the horse $\frac{1}{2}$ grain; repeat the dose in fifteen minutes if the pulse improves.

Other antidotes suggested are digitalin and inhalations of amyl nitrite. The body and extremities should be kept warm, and artificial respiration adopted.

MEDICINAL USES.—Aconite is not so frequently employed in the present day as in former times. Being a powerful depressing agent, its use is contra-indicated in most cases of respiratory affections, and other agents are found safer and more effectual as febrifuges. Its chief use in veterinary practice is in the treatment of laminitis, in which disease it relieves pain and reduces the force and frequency of the pulse. It should be administered at first in a full dose, and afterwards repeated every two hours in half doses, being combined with the acetate of ammonium and salines.

In the early stages of erysipelas in the horse aconite is also useful. In chronic cough in the horse, powdered aconite leaves or root, in combination with other respiratory sedatives, is employed with temporary benefit, and it enters into the composition of a well-known patent preparation for this purpose.

Aconite is sometimes prescribed in the early stages of pericarditis.

Externally, aconite in the form of liniment is applied as a local anodyne to the swollen painful joints in rheumatic cases. Aconitine ointment is occasionally employed for a similar purpose.

The danger of absorption should be remembered, and aconite in any form should not be used as an external application for the dog.

Hellebore.

Veratri viridis rhizoma—Green hellebore rhizome.

The rhizome and rootlets of *Veratrum viride*.

Veratri albi rhizoma—White hellebore rhizome.

The rhizome and rootlets of *Veratrum album*.

ACTIONS.—Both of these varieties of hellebore resemble each other in their actions. The white variety is the more powerful. They contain several alkaloids, among which are jervine, cevadine, and traces of veratrine. Both resemble aconite to a certain extent in their actions. They depress and finally paralyse the medulla and spinal cord, lower blood-pressure, produce cardiac weakness, causing an imperceptible pulse and death from collapse.

In the horse attempts at vomiting are induced, also salivation, painful spasms, and partial paralysis of the hind-limbs. In some instances convulsions occur, which are believed to depend on irritation of the motor centres of the brain.

Formerly white hellebore was used as a dressing in the treatment of mange in the dog, and cases of poisoning from absorption of the drug are on record. The powdered hellebore produces irritation of the nostrils and violent sneezing if inhaled, and is an irritant to all mucous membranes.

The *antidotes* to hellebore are demulcents, stimulants, the hypodermic injection of morphine to relieve pain, and the administration of infusions of tannin, or of tannic and gallic acids, which form an insoluble compound with the unabsorbed portions of the drug.

Neither the white nor the green hellebore is used in veterinary practice in the present day, as both are dangerous and uncertain in their actions. They were formerly employed as sedatives in acute inflammatory affections.

White hellebore is a constituent of a patent powder for chronic cough in the horse; in this it is combined with aconite, arsenic, and tartar emetic.

Helleborus niger—the Christmas rose, or bear's foot, or black hellebore—the rhizome and rootlets of which were at one time employed as a constituent of blisters, and as anthelmintics, is now discarded, as it is a dangerous agent. It is an irritant poison, producing drastic purgation, gastro-enteritis, and cardiac depression.

Veratrine.

Veratrina—Veratrine—an alkaloid or mixture of alkaloids obtained from Cevadilla or Sabadilla, the dried ripe seeds of *Schænocaulon officinale*—a Mexican plant. It is said to consist of cevadine and cervine, as well as veratrine.

ACTIONS.—Veratrine resembles green and white hellebore in its actions, and in some respects it is allied to aconite.

Externally, it is an irritant to the skin and mucous surfaces; its secondary action is to depress the terminations of sensory nerves, and cause loss of sensibility in the parts to which it is applied.

Internally, it exerts marked effects on the nerves, circulation, respiration, and muscles. It is stated to have no marked action on the brain or spinal cord. It increases the excitability of motor nerves, but ultimately causes paralysis of their peripheral ends. It stimulates the peripheral ends of sensory nerves and then paralyses them. It has a special action on the muscles, increasing their contractile power, and producing a well-marked lengthening of their contraction. It also stimulates contraction of the muscular coats of the stomach and intestines, and thus increases peristaltic action. The effect on the heart is to lengthen its contractions and to reduce the frequency of the pulse; large doses lower blood-pressure, and cause a slow, feeble, and irregular pulse. Respiration is at first accelerated, but the effect of toxic doses is to lessen its rapidity and finally to paralyse the respiratory centre, death occurring from asphyxia.

Toxic doses in the horse cause salivation, purging, attempts at vomition, shallow respiration, muscular twitching, and violent contraction of the abdominal muscles.

In the dog, emesis occurs and paralysis of the extremities, preceded by convulsions.

The *antidotes* are similar to those advised for hellebore.

MEDICINAL USES.—Veratrine is seldom employed as a therapeutical agent in this country. Continental authorities recommend it in the treatment of gastric impaction in cattle, a dose of from 2 to 3 grains being injected hypodermically.

In cases of chronic rheumatism affecting the shoulder in horses, a dose of $\frac{1}{2}$ grain to $1\frac{1}{2}$ grains injected deeply into the muscles is advised. A combination of veratrine with eserine and pilocarpine is suggested in the treatment of impaction of the colon in the horse. In consequence of the violence of its action and its depressing influence on the circulation, it cannot be regarded as a safe agent under any conditions.

Stavesacre.

Staphisagriæ semina—Stavesacre seeds.

The dried ripe seeds of *Delphinium staphisagria*, a species of larkspur. They contain the alkaloids delphinine and staphisagrine, and also an oil, the oleum staphisagriæ.

Delphinine resembles aconitine in its actions in many respects. Staphisagrine paralyses motor nerves and arrests respiration, thus resembling curare in its actions.

ACTIONS AND USES.—Strong solutions of stavesacre, if applied too freely to the denuded skin of the dog, or if licked by the animal, become absorbed and may produce toxic symptoms, evidenced by nausea, cardiac weakness, and prostration.

The chief use of this agent in veterinary practice is as a parasiticide. A decoction prepared by boiling 1 part of the bruised seeds in 20 to 30 parts of water for two hours is employed for the destruction of lice, and should be rubbed into the skin; it destroys both the pediculi and their eggs. An ointment is also employed, and is prepared with 4 parts stavesacre seeds crushed, and 35 parts of benzoated lard; this is heated on a water-bath for two hours, then strained, and 4 parts of yellow beeswax added, and the entire components dissolved by heat. This may be used in the treatment of mange in the horse.

One part of the oil of stavesacre in 6 to 12 parts of olive or almond oil also forms an effectual parasiticide for pediculi.

These preparations should be used with caution in canine practice.

In the treatment of eczema and mange in small pet dogs, the oil of stavesacre may be combined with zinc oxide, sulphur, balsam of Peru, and lanolin. (See Appendix.)

Colchicum.

Colchici cormus—Colchicum corm. The fresh corm of *Colchicum autumnale*, the autumn crocus or meadow saffron, dried and powdered.

DOSES.—Horses, ʒss. to ʒi. ; cattle, ʒi. to ʒii. ; sheep, grs. x. to grs. xxv. ; dogs, grs. ii. to grs. viii.

Colchici semina—Colchicum seeds. The dried ripe seeds of *Colchicum autumnale*. These are said to be one-third stronger in quantity of alkaloid than the corms.

Tinctura colchici seminum—Tincture of colchicum seeds : 1 part of dried colchicum seeds in 5 parts of alcohol.

DOSES.—Horses, ʒii. to ʒss. ; cattle, ʒss. to ʒi. ; dogs, ℥v. to ℥x.

Colchicina—Colchicine—is a poisonous alkaloid found in colchicum. It is seldom used in veterinary practice.

ACTIONS OF COLCHICUM.—In *medicinal* doses it is a *diuretic*, but its action in this respect is at times uncertain. Authorities differ with reference to the precise action of this drug on the secretion of urine. Some state that it increases the amount of solid constituents excreted, others that it augments the fluid portion. Full doses exert *cholagogue* and *purgative* actions.

TOXIC ACTIONS.—Colchicum in toxic doses, or in full doses repeated, produces gastro-intestinal irritation, purging, cardiac depression, abdominal pain, rapid thready pulse, and death from collapse. The sensory nerves become paralysed, also the spinal cord, but the motor nerves and muscles are unaffected, and the agent is said to exert no well-marked action on the brain. Cases are on record of colchicum-poisoning in the horse resulting from the stalks, leaves and seeds of this plant being mixed with hay. The symptoms observed were colic, tympanites, purging, and great depression, death occurring in twenty-four hours. The autopsy showed acute gastritis, with patches of erosion on the gastric mucous membrane.

In cattle the toxic symptoms observed were abdominal pain, violent purging (the excreta containing blood), an imperceptible pulse, and coma. The post-mortem appearances were those of acute gastritis, with patches of erosion.

The dog is more susceptible to the toxic effects of the drug than herbivora, the prominent symptoms observed being vomiting, purging, blood-stained evacuations, and death from collapse.

The suitable *antidotes* are demulcents, such as white of egg, arrowroot, barley-water, linseed-tea, etc. Tannic or gallic acid in large doses act as chemical antidotes, and should be frequently repeated. If there are signs of collapse, stimulants such as alcohol and ammonia are indicated. If pain be a prominent symptom, a hypodermic injection of morphine should be given. In the dog, the early treatment should consist of an emetic, if vomiting is not induced by the drug itself.

MEDICINAL USES.—In cases of chronic rheumatism, colchicum combined with sulphate of magnesia sometimes gives favourable results. By its diuretic action it is believed to assist in removing the products of the disease, but its specific action is doubtful, and other agents have taken its place, not only in the treatment of rheumatism, but in other affections. In combination with potassium iodide, it has been recommended in the treatment of rheumatic pericarditis in the horse.

CHAPTER XIII

THE VEGETABLE KINGDOM (*continued*)

Opium.

THE milky exudation obtained by incision from the unripe capsules of *Papaver somniferum*—the white poppy. This exudation is inspissated by spontaneous evaporation. The Turkey opium is preferred for pharmacy.

Opium, when dried and powdered, should contain between 9·5 and 10·5 per cent. of anhydrous morphine.

DOSES OF POWDERED OPIUM.—Horses, $\bar{5}$ i. to $\bar{5}$ ii.; cattle, $\bar{5}$ ii. to $\bar{5}$ iii.; sheep, grs. x. to grs. xxx.; dogs, gr. ss. to grs. ii. These doses must be modified according to the size of the animals and to circumstances.

INCOMPATIBLES OF OPIUM.—Alkaline carbonates, lime-water, salts of lead, iron, copper, mercury and zinc, liquor arsenicalis, and vegetable astringents.

PREPARATIONS OF OPIUM EMPLOYED IN VETERINARY PRACTICE.

Tinctura opii—Tincture of opium; laudanum. This consists of opium treated with equal volumes of distilled water and alcohol, and standardised to contain 0·75 gramme of anhydrous morphine in 100 c.c. It contains $\frac{1}{5}$ grain of morphine in 29 minims, and about 33 grains of opium in each fluid ounce.

DOSES.—Horses and cattle, $\bar{3}$ i. to $\bar{5}$ iii.; sheep and pigs, $\bar{5}$ ii. to $\bar{5}$ iv.; dogs, \mathbb{N} v. to \mathbb{N} xx. These doses should be modified according to requirements.

Extractum opii liquidum—Liquid extract of opium. This is of the same strength as tincture of opium.

Liquid opium concentrated is an assayed preparation of opium introduced by Messrs. Parke, Davis and Co. It is seven times stronger than the above liquid extract, containing 24 grains of morphine to the ounce, and is convenient, economical, and reliable for preparing the British Pharmacopœia tincture of opium. For this purpose it is diluted with alcohol and water as follows: Liquid opium concentrated, $2\frac{3}{4}$ fluid ounces; alcohol (90 per cent.), $8\frac{5}{8}$ fluid ounces; water, $8\frac{5}{8}$ fluid ounces.

Tinctura camphoræ composita—Compound tincture of camphor; Paregoric. This contains tincture of opium, camphor, benzoic acid, oil of anise, and alcohol. One drachm contains about $\frac{1}{4}$ grain of opium.

The suitable doses of this preparation are double those stated for tincture of opium (see p. 243).

Unguentum gallæ cum opio. This ointment contains 7·5 per cent. of opium, with galls, 1 part, and benzoated lard, 4 parts.

It is employed as a local application in the treatment of hæmorrhoids in the dog.

Liquor opii sedativus (Battley). This is a proprietary preparation of opium. It resembles the liquid extract, but is stronger, and is said to be superior to the tincture as an anodyne and sedative.

Its high price prohibits its employment for the horse, but in canine practice it is prescribed in doses of from 5 to 10 minims.

Opium contains a number of constituents, among which are many alkaloids. Of the latter the most important are morphine, heroin, codeine, and thebaine. Heroin and codeine are derivatives of morphine.

Morphina—Morphine.

This alkaloid is the most important, as the anodyne and sedative actions of opium are principally due to its presence. It is obtained from opium by complex chemical processes. In consequence of its slight solubility in water, it is not used

in its alkaloidal form, but by combining it with an acid it forms a salt which is soluble.

The common salts of morphine in use are the hydrochloride, the acetate, the sulphate, and the tartrate.

Morphinæ hydrochloridum — Morphine hydrochloride. This was formerly known as the hydrochlorate of morphine. It is the salt of morphine most commonly employed.

DOSES.— By hypodermic injection : Horses, grs. ii. to grs. iv. ; cattle, grs. iv. ; sheep, gr. ss. to gr. i. ; dogs, gr. $\frac{1}{8}$ to gr. $\frac{1}{4}$. If given by the mouth, double these doses will be necessary.

Liquor morphinæ hydrochloridi (British Pharmacopœia) contains $4\frac{3}{8}$ grains of morphine hydrochloride to the ounce, or 11 minims contain $\frac{1}{10}$ grain.

The hypodermic dose for the dog is from 10 to 20 minims.

For the horse, a more convenient solution for hypodermic use is prepared, which contains 2 grains of morphine hydrochloride in each 25 minims.

Tabloids and pellets are now prepared containing accurate doses of this salt. They are readily soluble in water, and are both convenient and reliable for forming hypodermic injections.

The other salts of morphine—viz., morphinæ acetat, morphinæ sulphas, and morphinæ tartras—may be prescribed in similar doses to the hydrochloride.

Injectio morphinæ hypodermica—the official hypodermic injection of morphine of the British Pharmacopœia—contains 1 grain of morphine tartrate in each 22 minims.

The dose for the horse is about 40 to 60 minims, and for the dog 2 to 5 minims.

INCOMPATIBLES of morphine salts are similar to those mentioned under opium.

Apomorphinæ hydrochloridum — Apomorphine hydrochloride. This is a derivative of morphine or codeine, obtained by heating them with an excess of hydrochloric acid in sealed tubes.

Its chief use is as an *emetic* for the dog in cases of poison-

ing. It exerts its emetic effect by acting on the vomiting centre in the medulla, and, administered by hypodermic injection, it usually acts in from two to three minutes, producing little nausea or depression.

In cases of narcotic poisoning, however, apomorphine may fail to act owing to a depressed condition of the vomiting centre. It is especially useful when there is inability to swallow.

DOSE.—By hypodermic injection: For the dog, $\frac{1}{25}$ to $\frac{1}{10}$ grain; or by the mouth, $\frac{1}{10}$ to $\frac{1}{5}$ grain. It also possesses expectorant actions, and is occasionally prescribed in doses of $\frac{1}{50}$ to $\frac{1}{20}$ grain in cases of acute and chronic bronchitis.

Codeina—Codeine, an alkaloid obtained from opium or from morphine. It is a methylic ether of morphine.

Codeine is sometimes employed in the treatment of diabetes mellitus in the dog and occasionally proves useful.

The dose is from $\frac{1}{4}$ to $\frac{1}{2}$ grain three times a day at first, and then increased gradually until the sugar disappears from the urine or increasing drowsiness occurs.

Thebaine is present to the extent of $\frac{1}{2}$ per cent. in opium. It resembles strychnine more than morphine, as it stimulates the motor tract of the spinal cord and produces convulsions. It is of no therapeutical interest.

Tinctura chloroformi et morphinæ composita—Chlorodyne.

The chlorodyne of the British Pharmacopœia is composed of morphine hydrochloride, dilute hydrocyanic acid, chloroform, tincture of Indian hemp, tincture of capsicum, oil of peppermint, glycerine, and alcohol. Each 10 minims of this preparation contains morphine hydrochloride $\frac{1}{11}$ grain; chloroform $\frac{3}{4}$ minim; dilute hydrocyanic acid $\frac{1}{2}$ minim; tincture of Indian hemp 1 minim, and tincture of capsicum $\frac{1}{4}$ minim.

The dose for horses and cattle is from $\bar{\text{ʒ}}\text{i.}$ to $\bar{\text{ʒ}}\text{ii.}$, and for dogs from $\mathfrak{M}\text{v.}$ to $\mathfrak{M}\text{xv.}$

Various formulæ are employed in the preparation of chlorodyne for veterinary purposes. The amount of morphine present is usually 4 grains to the fluid ounce.

Pulvis ipecacuanhæ compositus—Dover's powder. Ipecacuanha, 1; opium, 1; potassium sulphate, 8.

DOSE.—Horses, ʒii. to ʒiv.; dogs, grs. v. to grs. xv. (see p. 361).

ACTIONS OF OPIUM.

In consequence of the number of alkaloids present in opium, its actions are complex.

Externally, the local action of opium when applied to the unbroken skin is not definitely decided. Some authorities believe that it lessens the sensibility of the sensory nerves when applied in the form of liniment. If injected subcutaneously, it acts as a local anodyne. When applied to abrasions of the skin, to ulcers, and to mucous surfaces, it also acts as a local anodyne, and can be absorbed therefrom.

Internally, medicinal doses diminish the secretion of saliva and cause dryness of the mouth. Large doses, however, may cause an increased flow of saliva.

On the Stomach.—Opium reduces the sensibility of the gastric nerves, and tends to diminish the flow of gastric juice and to derange digestion. Full doses in the dog may induce vomiting, resulting from primary irritation of the gastric nerves; this action is brief.

On the Intestines.—Opium in moderate doses lessens peristaltic action and induces constipation. It diminishes intestinal secretion, and depresses the sensibility of the intestinal mucous membrane. Large doses produce a paralysed condition of the intestines.

In human beings very small doses of opium have been found to increase peristaltic action, and sometimes to produce a purgative effect in cases of constipation depending on reflex irritation. This is believed to depend on the drug lessening the action of the inhibitory nerves of the intestine, or perhaps diverting the stimulus to the stimulating fibres (Sir T. Lauder Brunton).

Experimentally it has been demonstrated that if laudanum be injected into the veins, it exerts a powerful purgative effect in carnivora, acting chiefly on the small intestine. In

veterinary practice we find that opium or morphine, given either in small or large doses, does not produce increased peristalsis, but has the opposite effect. The actions of opium are comparatively slowly developed when the drug is administered by the mouth, as absorption is slow.

On the Nervous System.—The actions of opium and morphine differ considerably in man and in the horse.

In man the higher centres of the cerebrum are developed to a far greater degree than in animals, hence the chief effect of the drug is to induce sleep; this may be preceded by a brief period of excitement.

In the horse these higher brain-centres are less developed, but there is relatively more development of the locomotor centres and of the reflex centres of the spinal cord. Hence the sedative and hypnotic effects of opium are by no means so well marked as in man, and, if full or repeated doses be given, the drug produces symptoms of excitement, evidenced by restlessness, pawing, and walking in a circular direction. This is followed after an indefinite period by drowsiness, a staggering gait, and extreme nausea. These effects depend on stimulation of the locomotor centres and of the reflex centres in the spinal cord.

In some cases moderate doses may produce a sedative effect, and relieve the pain of ordinary spasmodic colic. But in cases of prolonged pain, such as that depending on impaction of the intestine, and in the violent pain of enteritis, peritonitis, volvulus, etc., moderate doses produce no analgesic action, and if full doses be given the characteristic symptoms of excitement are induced.

In ruminants full doses also produce excitement, and it is only after large amounts have been administered that the hypnotic effects of the drug become manifest. In the dog moderate doses exert a primary exciting effect; this is followed by sleep. Full doses cause preliminary excitement, but the hypnotic action of the drug is not so well marked as in man, and the sleep induced is accompanied by muscular twitchings and is not profound.

On the Motor Nerves the action of opium is not yet

understood. According to some authorities, the motor centres are first depressed, this action then extending to the nerves themselves. Others state that the action of the drug on these nerves is slight, and that towards the later stage of poisoning by this agent they become paralysed.

The Sensory Nerves are first depressed and then paralysed. It is believed that the drug acts first on the sensory centres and next on the peripheral terminations and on the nerve-trunks. The result of this action is that the sensibility of all organs of the body is diminished, and pain cannot be originated therein. In toxic doses opium paralyses the vital centres in the medulla, and death is caused by asphyxia, depending on paralysis of the respiratory centre.

On the Heart and Circulation.—The primary effect is to produce a fuller and quicker pulse, and to cause dilatation of the cutaneous bloodvessels. Large doses render the pulse at first slow and full, but later, when coma proceeds, the pulse becomes feeble. Small doses have little effect on the vaso-motor centre, but toxic doses paralyse it.

According to Sir T. Lauder Brunton ('Text-book of Pharmacology, Therapeutics and Materia Medica'), opium has a special action on the peripheral vaso-motor apparatus. His experiments have demonstrated that this drug by its action on the peripheral terminations of the vaso-motor nerves, as well as by acting on the vaso-motor centres, prevents or diminishes the reflex dilatation of vessels which usually results from local irritation.

On this action, as well as on its power of lessening the peristaltic action of the intestines, and thus diminishing local irritation, the value of opium in the treatment of peritonitis is believed to depend; the dilatation of the bloodvessels being prevented, congestion is checked.

On the Heart, opium exerts very little direct action, according to some authorities. The acceleration of the pulse that occurs after small doses is believed to be due to stimulation of the cardiac centre.

On Respiration, opium acts as a *depressant*, not only exerting this action on the respiratory centre, but also on

the pulmonary branches of the vagus. The result of this depression is that reflex respiratory acts, such as coughing, etc., are less liable to occur. Toxic doses arrest respiration by paralysis of the respiratory centre. The bronchial secretions are diminished, this being probably due to the action of the drug on the bronchial glands.

On the Skin.—Moderate doses in the horse do not produce any appreciable effect on the cutaneous secretion, but large or repeated amounts may cause sweating. Toxic doses may produce profuse sweating towards the later stages, probably depending on stimulation of the sweat centres in the spinal cord induced by the venous condition of the blood.

In the dog a dry, congested condition of the skin is observed.

On the Kidneys.—The action of opium is variable, the urine being lessened in amount in some cases and increased in others. The functions of the liver are interfered with, and the general activity of metabolism is reduced.

On the Eye.—In the horse the pupil is generally dilated by opium, this depending on some special action of the drug on the central nervous system. Topical application produces no effect on this organ.

In the dog the pupil is contracted while the animal is under the narcotic influence of the drug.

Opium is excreted by the skin, intestines, and liver, but principally by the kidneys. Excretion commences rapidly, but after full doses have been administered it may not be completed for several days. It is probably also excreted by the gastric mucous membrane, as morphine can be detected in the stomach, even when it has been administered by hypodermic injection. On this probably depend the nauseating effects of full doses of opium which occur in all animals.

TOXIC ACTIONS.—Experiments have demonstrated that large doses of opium or morphine can be tolerated by the horse without producing fatal effects. In cases of acute abdominal pain still larger amounts can be given, as the drug under these conditions appears to lose its full effects.

The toxic dose of morphine sufficient to cause death is said to be from 45 to 75 grains, administered hypodermically, and of opium from 2 to 2½ ounces, given by the mouth. Of course, individual susceptibility has an important influence on the toxic actions of this drug, and in some instances delirium is more easily induced than in others.

In some nervous, excitable horses 4 or 5 grains may produce the characteristic symptoms already mentioned. Excessive doses induce violent delirium in some horses: the animals become partially blind, and rush against surrounding objects; the gait is staggering, sweating is profuse, and respiration is laboured. When the violent symptoms subside marked depression results; the animal stands immovable, and appears to suffer extreme nausea. In those cases where toxic doses have caused death, convulsions preceded the fatal termination.

In the dog, toxic doses of opium or morphine cause vomiting, delirium, clonic spasms, and stertorous breathing. The toxic dose of morphine is from 2 to 3 grains.

The *post-mortem* appearances are those of death from asphyxia. The ventricles of the brain contain a quantity of serous fluid, the cerebral and spinal veins are distended, and slight extravasation of blood into the tissues may be observed.

ANTIDOTES.—Cases of poisoning by opium are very rare in animals. The exciting effects of the drug that occur in the horse after full and repeated doses have been given for the relief of pain usually pass off without any treatment being necessary.

The antidotes recommended are potassium permanganate, 6 grains of which are said to neutralise 1 ounce of laudanum. The addition to this of acetic acid or vinegar renders it a more effectual antidote.

In the dog emetics should first be given. If the ordinary ones fail, the hypodermic injection of apomorphine is advised. Measures should be adopted to rouse the animal, and the alternate use of hot and cold water as a douche to the head and neck is useful. The inhalation of ammonia

acts as a stimulant. Artificial respiration should be resorted to, and the surface of the body kept warm.

The hypodermic injection of atropine is also advised as a stimulant to the respiratory centre. This requires great discrimination. The hypodermic injection of strychnine has given good results. Strong coffee is also recommended in the form of enemata.

ACTIONS OF THE PRINCIPAL ALKALOIDS OF OPIUM.

Morphine. — The actions of opium depend chiefly on morphine. Morphine is more readily absorbed than opium, and acts more quickly. It is also said to be less constipating and less nauseating. Morphine is of definite composition, while opium is often variable. It exerts more pronounced sedative effects, in consequence of the absence of constituents possessing convulsant actions that are present in opium.

Another advantage of morphine is that it can be administered by hypodermic injection. Opium exerts a marked local action on the intestines, and hence is preferred to morphine in the treatment of diarrhoea and dysentery.

Codeine possesses but slight hypnotic actions. It has a special action on the nerves of the abdominal viscera, lessening their irritability, and it is stated that if this drug be given for several days irritants such as arsenic produce no effect.

Codeine stimulates the motor centres in the brain, and in full doses causes muscular twitching, irregular movements of the limbs, and symptoms of general excitement. Toxic doses produce convulsions. It also lessens the irritability of the respiratory nerves, and thus acts as a respiratory sedative. Its therapeutic action in cases of diabetes mellitus probably depends on its power of lessening the irritability of the afferent nerves of the abdominal viscera, and thus preventing dilatation of the hepatic vessels. Experimentally it has been demonstrated that stimulation of the central end of the cut vagus causes dilatation of the hepatic vessels and the presence of sugar in the urine.

Apomorphine, as already mentioned, acts as a prompt emetic in carnivora. It possesses no action on sensory or motor nerves. Toxic doses in the dog stimulate the motor centres of the central nervous system, causing in some instances 'circus movements,' the animal running unceasingly in a circle, the respirations are accelerated, tetanic convulsions occur, and death results from asphyxia.

In the horse doses of 2 grains cause delirium, sweating, and marked respiratory distress.

CIRCUMSTANCES MODIFYING THE ACTION OF OPIUM AND MORPHINE.

(a) *Susceptibility*. — In young animals opium is more quickly absorbed than in adults, and the effects on the nervous system are more marked. Hence discrimination is necessary in prescribing it in such cases, and the doses must be carefully regulated. An idiosyncrasy to the action of the drug is met with in some horses, even moderate doses exerting exciting effects.

(b) *Disease*. — In cases characterised by the presence of severe pain large doses of opium are tolerated without producing toxic effects. In gastric and intestinal affections, where absorption is retarded, large doses of opium administered by the mouth may produce no effect. In nephritis the excretion of the drug is interfered with. Hence moderate doses exert their action in a more marked manner than under ordinary conditions.

(c) *Combinations with other Drugs*. — Morphine is often prescribed in combination with atropine. The latter drug is said to prevent or relieve certain undesirable effects of the former, such as nausea, depression, and constipation. We have never found any advantage from this combination, and in the horse the atropine appears to intensify the exciting effects of the morphine.

In some respects the actions of atropine are antagonistic to those of morphine. Thus atropine stimulates the respiratory centre, and morphine depresses it. Atropine acts as an anhydrotic by influencing the terminal nerves in the

sweat-glands. Morphine produces diaphoretic effects by acting on the nerve-centres. Atropine depresses the inhibitory branches of the splanchnic nerves, and thus tends to increase peristaltic action of the intestines. Morphine lessens peristaltic action, and induces constipation. Chloral, combined with morphine, lessens the tendency of the latter to produce exciting effects.

MEDICINAL USES OF OPIUM.

As an anodyne, especially in cases of abdominal pain, opium in various forms has been prescribed from the earliest times. The favourite combination of tincture of opium and sweet spirit of nitre is still largely employed in the treatment of spasmodic colic and allied affections in the horse. In recent years, however, practitioners have observed that many cases of simple colic recover spontaneously or with the assistance of a diffusible stimulant, and the tendency to commence treatment by the administration of an opiate is altered in accordance with modern views.

In cases of colic depending on obstruction of the large intestines, the administration of opiates to relieve the pain is irrational treatment, as both opium and morphine interfere with the normal peristaltic action of the intestines and increase the tendency to intestinal paralysis, which is already present. In such cases pain is often very acute and continuous, and ordinary doses of opium fail to give relief. If it be given in increased amount, not only is paralysis of the intestine induced, but also the exciting effects of the drug are manifested. For the rational treatment of this affection (see p. 457).

In the treatment of cases such as acute enteritis, volvulus, intussusception, etc., in the horse, which from their nature are fatal, all that the practitioner can do is to relieve his patient from pain by the administration of full doses of anodynes. We cannot regard opium or morphine as either effective or desirable for this purpose, as moderate doses have no anodyne effect, while full and repeated doses

produce excitement, and cause the animal to walk continuously round his stall.

Whether pain is felt or not during this delirious condition is a matter of opinion. At any rate, the appearance of the patient is not calculated to inspire either the owner or the attendant with the idea that our treatment is giving the animal any relief. In such cases we have found that *cannabis indica* is an efficient anodyne (see p. 466).

Experience teaches us that in the treatment of any affections in the horse where anodynes or sedatives are indicated we can obtain better results from other agents than from opium or morphine. Chloral hydrate has now largely taken the place of opium, as it relieves pain, it does not induce exciting effects even in full doses, it does not cause paralysis of the intestines, nor does it produce the extreme nausea that occurs after the administration of full doses of opium or morphine (see p. 454).

In the treatment of diarrhœa and dysentery, opium is a valuable agent, and may be combined with astringents such as chalk, catechu, etc. Its application in this respect will be found on p. 471. In such cases chlorodyne often proves more effectual than other preparations of opium.

In cases of post-partum straining and in cases of eversion of the uterus, bladder, rectum, or vagina the use of opium is indicated. It prevents the patient from straining, and thus enables the everted organ to remain *in situ* when replaced. In such cases opium with belladonna is also applied to the organ before being returned to its normal position.

In canine practice opium proves an efficient anodyne; but the doses must be carefully regulated, otherwise vomiting and extreme nausea result.

In cases of abdominal pain in the dog, discrimination is necessary in prescribing opiates, as they mask the symptoms, and thus may lead the practitioner to overlook the necessity for performing laparotomy. This operation, if it is to be of any value, must be carried out before the vital powers of the animal become exhausted, and, if the symptoms

which indicate its employment be disguised by opiates, an erroneous diagnosis and a fatal result will ensue. We must also take into consideration the depressing effects of opium in such cases, which must tell against the success of the operation.

Morphine is an antidote to strychnine poisoning in the dog, and Colonel F. Smith, A.V.D., records a case in which the hypodermic injection of 5 grains of morphine brought about a successful result in an apparently hopeless case of strychnine poisoning in this animal.

Externally, opium is employed in the form of liniment as a local anodyne to bruises, contusions, and superficial inflammations.

CONTRA-INDICATIONS OF OPIUM AND MORPHINE.

(a) In affections of the brain, such as congestion or inflammation of this organ, opiates should be avoided, as they increase the tendency to coma. In meningitis they have no effect in medicinal doses, and in full amounts they increase the excitement and struggling movements of the patient.

(b) In diseases of the respiratory organs, with shallow, distressed breathing, opiates, by their depressing effect on the respiratory centre, increase the tendency to asphyxia. They should also be avoided in cases of bronchitis.

(c) In affections of the kidneys in the horse, also in uræmia, opiates should not be given. In canine practice morphine occasionally proves useful in such conditions, but its employment requires great discrimination.

(d) In cases of abdominal pain, depending on impaction of the intestine, with cessation of peristaltic action, opiates, for obvious reasons, should be avoided.

Heroin.

Heroin, also known as **Heroine**.—This is a derivative of morphine, and is technically known as diacetyl-morphine.

From the above is prepared :

Heroin hydrochloride—Diacetyl-morphine hydrochloride.

This salt is the form in which the drug is prescribed.

DOSES.—Horses, gr. ss. to gr. i., repeated every three hours; dogs, gr. $\frac{1}{10}$ to gr. $\frac{1}{8}$, every three hours.

INCOMPATIBLES.—Alkalies, such as sodium bicarbonate and ammonium carbonate.

ACTIONS.—Heroin differs in its actions from morphine in some important respects. It is far less narcotic than morphine, it does not depress the respiratory centre in medicinal doses, it is far less toxic, and it does not produce undesirable after-effects.

The researches of Guinard (*Journal de Physiol. et de Path. Gén.*, 1899) show that the effects of heroin varied in different animals. Toxic doses, given by intravenous and hypodermic injection, produce a narcotic action on the dog and an exciting effect on the horse and cat. The donkey is said to be specially susceptible, as 0·00035 gramme per kilogramme of body-weight, given hypodermically, proved fatal.

In the dog heroin rendered the pulse slower, but increased its force, while the blood-pressure was somewhat lowered. In the horse it caused an increase in the heart-beats, and raised the blood-pressure.

On respiration, marked and important effects were produced. The respirations were rendered slower, but increased in depth, by moderate doses.

Large doses tend to depress the respiratory centre, and in the dog the respirations were increased in frequency.

According to St. Martin ('*Les Nouveaux Remèdes*,' 1900), the administration of repeated daily doses to dogs does not produce any ill-effects. Comparatively large doses were given in the experiments he conducted—viz., 0·01 gramme to 7·0 per kilogramme of body-weight, and 0·02 gramme to 9·5 per kilogramme of body-weight. His deductions from these experiments are that the daily administration of heroin in moderate doses to dogs is well borne, the sedative and other effects being regularly obtained without alteration of nervous functions and without any interference with nutrition or general condition.

The exact action of heroin on respiration is not yet definitely known. The drug is said to cause increased

depth of inspirations, and to render them slower, the result being a more perfect aeration of the blood.

Other observers state that, in addition to the above action, heroin diminishes oxidation, lessens heat production, and lowers temperature. Some, indeed, have termed it a respiratory tonic, and compare its effects on the respiratory centre to that of digitalis on the heart.

The value of heroin in the treatment of irritable cough in the horse and dog is undoubted. Its *modus operandi* in this respect cannot be attributed to its action on respiration, as mentioned above. We should imagine that it must, in addition, exert some sedative effect on the respiratory nerves or on their peripheral endings.

Cases are recorded of accidental poisoning by heroin in human beings. In one instance $2\frac{1}{2}$ grains were taken by mistake, and the symptoms observed were general weakness, interference with vision, marked contraction of the pupils, slow pulse, nausea, cramps in the limbs, and a subnormal temperature. The antidotes employed were caffeine and coffee, and the patient recovered in three days.

MEDICINAL USES.—Heroin is a valuable agent in the treatment of bronchitis and in cases of irritable coughs. In our experience it exerts favourable effects in the secondary stages of bronchitis, in chronic bronchitis, and in asthmatic affections in the dog.

We have administered it in cases of 'broken wind' in the horse, and found, as might be expected, that its effects were only palliative.

In the treatment of coughs depending on various causes we have found heroin to give better results than those obtained with any other agent. We have not observed any ill-effects in the horse from doses of 1 grain given by the mouth three times a day.

The most convenient form to administer the agent is in combination with glycerine. Chemists supply various combinations of heroin and glycerine, and there is also a proprietary preparation known as Glyco-heroin. They usually contain $\frac{1}{10}$ grain of heroin-hydrochloride in each fluid

drachm, combined with ammonium hypophosphite and hyoscyamus.

The dose for the dog is from 10 minims to $\frac{1}{2}$ drachm, according to the size of the animal and the severity of the case.

For the horse the average dose is 1 ounce, repeated three or four times daily; but doses of 2 ounces can be administered with safety.

The drug may also be combined with terpene hydrate.

Indian Hemp.

Cannabis indica—Indian hemp.

The dried flowering or fruiting tops of the female plants of *Cannabis sativa*, from which the resin has not been removed. It is grown in India. The active principle is stated to be cannabinol, a reddish-coloured oil which is obtained from the resin by distillation. The therapeutic value of the drug is contained in the resin. *Cannabis indica* contains other constituents—viz., a glucoside cannabin and a volatile alkaloid, cannabinine.

PREPARATIONS.

Extractum cannabis indicæ—an alcoholic extract.

DOSES.—Horses, $\bar{3}$ ss. to $\bar{3}$ i.; dogs, gr. $\frac{1}{4}$ to gr. i.

Tinctura cannabis indicæ—1 part of extract in 20 parts of alcohol; 22 minims contain 1 grain of the extract.

DOSES.—For the dog, \mathbb{M} v. to \mathbb{M} xv.

The tincture is not convenient for the horse in consequence of the large dose that is necessary; also the addition of water precipitates the resin, so that the drug must be suspended in a mucilaginous fluid before diluting it for administration.

For the horse the extract of *cannabis indica* is the preparation employed, and it is preferably given in the form of an emulsion, but may also be administered in the form of bolus. Preparations of *cannabis indica* are found to vary very much in their activity, and some are almost inert. This is usually due to the drug not being fresh, or that it is deficient in the constituents on which its action depends.

A fluid extract which is standardised physiologically—i.e.,

its strength determined by the effects it produces on animals—can now be obtained from Messrs. Parke, Davis and Co., London; this is always reliable, and produces its effects in half the doses required of the ordinary extract. No reliable active principle or alkaloid has as yet been isolated from *cannabis indica*, so that hypodermic injections of this drug cannot be availed of.

ACTIONS.—*Cannabis indica* exerts *anodyne* and *hypnotic* actions. The delirium which is induced in man by this drug is not observed in animals. It is difficult in some instances to estimate the proper dose for the horse, as some are more susceptible to its action than others. The average dose of a reliable preparation is $\frac{1}{2}$ ounce, and this usually commences to act in from twenty minutes to half an hour. No primary exciting action occurs in the horse, but the animal assumes a sleepy appearance, the head is shaken in a listless manner, the eyelids droop, there is disinclination to move, and the standing posture is maintained; the animal appears unconscious to surrounding influences. These effects gradually pass off in from ten to twelve hours, constipation is not observed nor is appetite interfered with to the same extent as after the administration of opiates. Larger doses, such as an ounce of the extract, cause in some horses an alarming condition of narcosis. The lips are retracted, the eyelids closed, the tongue hangs from the mouth, the respirations are accelerated and may be stertorous, there is partial loss of control over the hind extremities, and the animal stands persistently; the pulse becomes weak, salivation is profuse, and the penis may be pendulous; common sensibility is also interfered with, as there is no response to puncturing the skin with a needle. This state of narcosis may continue from twenty-four to thirty hours, and then gradually pass off; the degree of nausea resulting is slight, but the peristaltic action of the bowels is interfered with and constipation occurs.

We have no evidence of fatal results occurring from toxic doses of *cannabis indica* in the horse. According to Colonel Smith, A.V.D., who first drew the attention of the profession to the therapeutic value of this agent, very large

doses will not produce death, although a very profound condition of narcosis results.

In the dog, cannabis indica in doses of 10 grains to 2 drachms produces stupor and paralysis of the hind-limbs; this narcotic condition may last for two days, and the animal may recover.

MEDICINAL USES.—Clinical experience teaches us that in cannabis indica we have the most reliable anodyne for the horse; that is, for those cases in which it is desirable to employ a narcotic agent (see p. 466). Of course its use is not indicated in cases of abdominal pain depending on obstruction of the intestines with ingesta, as, like all narcotics, it interferes with intestinal action. Neither is it to be prescribed in an indiscriminate manner, but it should be reserved for cases in which, from a consideration of the symptoms, we conclude that beyond giving relief to the pain, we can do nothing more for our patient. Hence the drug is indicated in enteritis and peritonitis, as it is our duty to give our patients as much relief as possible in such cases. In cases of volvulus and intussusception, which are of necessity fatal, full doses of cannabis indica give the animal relief from pain and ‘smooth the path to death.’

In canine practice cannabis indica is seldom prescribed. It has been tried in the treatment of chorea, but with indifferent results.

Apocynum.

Apocynum — the root of *Apocynum cannabinum* — also known as American Indian hemp, or Canadian hemp, and in America as black Indian hemp.

PREPARATION.

Extractum apocyni fluidum.

Doses for the dog: ℥v. to ℥xv.

Tinctura apocyni—Apocynum root, 1 part; proof spirit, 10 parts.

Dose for the dog: ℥v. to ℥xx.

ACTIONS AND USES.—Apocynum is a powerful diuretic, and in full doses a hydragogue cathartic. In the dog large

amounts act as an emetic as well. It causes profuse diuresis, mainly by its action on the renal bloodvessels. It renders the pulse slower and fuller, and strengthens the action of the heart; but is said not to cause contraction of the arteries. In its action on the circulation it resembles strophanthus. Toxic doses cause death by syncope.

This drug is employed in human medicine as a diuretic, especially in America. It is said to produce very beneficial effects in cases of dropsy, whether of renal or cardiac origin, mainly through causing a removal of the ascitic fluid, by the kidneys.

According to Dr. Dabney (*Therapeutical Gazette*), the albumin which is always present in ascitic fluid is not removed from the system by the action of apocynum, and he claims that this agent has given most favourable results in renal and cardiac cases accompanied by anasarca. In consequence of its action in the removal of ascitic fluid, it has been termed 'the vegetable trocar.'

We have no evidence of the successful employment of this drug in veterinary practice, but it is certainly worthy of trial, especially in canine practice. A reliable preparation should be used, as many of those supplied are said to be deficient in strength and prepared from spurious specimens of the plant.

Cocaine.

Cocaina—Cocaine.

An alkaloid obtained from the dried leaves of *Erythroxylum coca*, a South American shrub.

Cocainæ hydrochloridum—Cocaine hydrochloride.

A crystalline salt of cocaine.

INCOMPATIBLES.—Alkalies and alkaline carbonates, borax, carbolic acid, mercurous and mercuric chlorides, and the majority of soluble silver salts.

ACTIONS.—Cocaine, if applied in solution to the skin and mucous surfaces, or injected hypodermically, acts as a *local anæsthetic*. It produces this effect by paralysing the sensory nerves of the part, and it also contracts the capillaries. A

4 per cent. solution applied to the eye renders the superficial structures anæsthetic, paralyses accommodation, and dilates the pupil. The latter action is more marked in the dog than in the horse.

The local anæsthetic action commences in about five minutes, and may continue for thirty minutes. Ten per cent. solutions applied to a mucous membrane blanch the part, as well as remove sensation therefrom, the former action probably being due to contraction of the local capillaries. Surface application does not induce anæsthesia of the deep parts, nor does its effect last long.

When a solution of the drug is injected hypodermically sensation is removed from the deeper parts, especially if the injection be made along the course of a nerve. Strong solutions injected hypodermically may be absorbed and induce toxic symptoms, but surface applications to the skin have little tendency to become absorbed.

Internally, in small doses, cocaine is a stimulant, tonic, and restorative.

TOXIC ACTIONS.—In the horse, doses of from 60 to 80 grains, injected hypodermically, produce salivation, great excitement, quickened pulse, dilatation of the pupils, increase of reflex activity, and increased peristaltic action of the intestines. These effects pass off in about two hours.

The dog is very susceptible to the action of cocaine, the hypodermic injection of a strong solution of the drug producing in a few minutes epileptiform convulsions, champing of the jaws, profuse salivation, marked respiratory distress, tetanic spasms, and death from asphyxia. The convulsions are of cerebral origin. The cerebrum, medulla, and spinal cord are first stimulated and then paralysed. The sensory columns of the spinal cord and the peripheral sensory nerves are paralysed, but the motor columns are said to be unaffected. Blood-pressure is at first raised, but afterwards lowered, and the pulse is rendered slow.

ANTIDOTES.—The inhalation of amyl nitrite, stimulants such as ammonia and alcohol, and the hypodermic injection of ether.

USES.—Cocaine is not prescribed internally in veterinary practice. Its chief use is as a local anæsthetic in minor surgical operations.

For the dog a 4 or 5 per cent. solution may be used hypodermically for the painless removal of small tumours, etc. Stronger solutions are dangerous, as they may give rise to toxic symptoms. Indeed, in cases that are susceptible to the action of the agent even 5 per cent. solutions may cause serious symptoms. For this reason eucaïne is preferred by many practitioners as a local anæsthetic for the dog (see p. 265).

In ophthalmic surgery cocaine in 4 or 5 per cent. solution is applied to the eye at least twice before the operation is commenced. Foreign bodies in the eye are removed with facility after the local application of cocaine. In inflammation of the superficial structures of the eye, and in injuries to the cornea, and in corneal ulcer, the application of an eyelotion containing 2 grains of cocaine, 2 grains of atropine, and 2 grains of boric acid to the ounce of distilled water is productive of good results in the early stages.

In the horse a 10 or 20 per cent. solution of cocaine is employed hypodermically to produce local anæsthesia during the removal of small tumours, also for the operation of firing and for that of neurectomy. From 12 to 15 minims may be injected at three or four points underneath the skin, and into the growth in the case of tumours. For neurectomy the solution should be injected into the region of the nerve at the site selected for operation.

It has been found that a combination of cocaine with solution of adrenalin chloride greatly increases the local anæsthetic action of the former (see p. 389). Eucaïne is now preferred to cocaine for this purpose (see p. 266).

In the diagnosis of lameness cocaine is of assistance, as by injecting a solution over the course of the plantar nerves we can decide whether the cause of lameness is in the foot or otherwise. If the case be one of foot lameness, the animal will go temporarily sound as the result of the injection, while if the cause of the lameness be seated elsewhere

no effect will be produced. By injecting solutions of the drug into other regions of the limb, great assistance will be given in the diagnosis of lameness. One drachm of a 5 per cent. solution may be injected along the course of the plantar nerves above the fetlock.

As solutions of cocaine do not keep well, it is necessary to prepare them fresh, and convenient tablets or pellets of the drug are now supplied by chemists for this purpose. Cocaine solutions, containing chloretone as a preservative, are now prepared, and are said to keep active for an indefinite period. This requires further investigation.

Solutions of cocaine undergo decomposition if sterilised by boiling.

An ointment of cocaine is employed in the treatment of burns and scalds and in painful fissures of the heels in the horse. For these purposes the drug may be combined with boric ointment in the proportion of from 5 to 10 per cent.

β -Eucaine.

Eucainæ hydrochloridum B— β eucaine; beta-eucaine—is a synthetic compound, chemically allied to cocaine. Another form is known as α -eucaine, which is not now employed.

β -eucaine is of complex chemical composition, and is technically known as the hydrochloride of benzoyl-vinyl-di-aceton-alkamine.

Eucaine is a *local anæsthetic*, resembling cocaine in this respect, but it is slower in its action and less active, and requires to be used in double the strength of the latter. The advantages it possesses over cocaine are that it is three times less toxic, and its local anæsthetic action is more prolonged and more constant, and solutions can be sterilised by boiling, without undergoing decomposition.

Eucaine is preferred to cocaine as a local anæsthetic in canine practice. The strength of solution employed varies from 5 to 8 per cent., and the usual amount injected is about 20 minims. For ophthalmic use a 2 per cent. solution is recommended, 2 minims being applied to the eye every three minutes, until 10 minims have been used.

In human surgery the combination of eucaine with adrenalin solution has proved of marked value as a local anæsthetic. Dr. A. Barker, University College, London, advises the following combination of these agents (*Lancet*, July 25, 1903): β -eucaine, 3 grains; sodium chloride, 12 grains; solution of adrenalin chloride (1 to 1,000), 18 minims; and boiled distilled water, $3\frac{1}{2}$ ounces. Of this solution, from $\frac{1}{2}$ ounce to 2 ounces are injected at blood-heat, in small amounts, along the course of the nerves of the site of operation. In about twenty minutes the part becomes blanched and insensitive.

The effect of combining adrenalin solution with the eucaine is that a far less amount of the latter agent is required. Adrenalin causes contraction of the capillaries, and so diminishes the blood-supply in the part, the result being that the anæsthetic agent remains where it is injected, and exerts its effects.

We have found that a solution containing $\frac{1}{6}$ grain of eucaine hydrochloride and $\frac{1}{2000}$ grain of adrenalin chloride in each cubic centimetre (about 17 minims) acts most efficiently as a local anæsthetic both for horses and dogs.

For use in canine surgery, it is far preferable to cocaine, as it is practically non-toxic. We have injected up to $\frac{1}{2}$ ounce of the solution mentioned without producing any ill effects. Its local anæsthetic action is well marked. In addition, the influence of the adrenalin in retarding capillary circulation in the part when injected therein is of great assistance in the excision of tumours, as it enables us to recognise large bloodvessels and to ligature them before cutting them through. The amount of the solution that it is requisite to inject will depend on the extent of the tumour. About 20 minims may be injected with a fine hypodermic needle at different points around the base of the tumour, and after waiting for ten minutes the operation may be commenced.

It is also useful for the painless removal of tumours in the horse, but of course larger amounts must be used.

In the case of deep-seated tumours, the injections should be made very deep. This process is readily carried out by employing a fine hypodermic needle.

Messrs. Parke, Davis and Co., London, prepare a solution of the above strength, and term it 'Eudrenine.' This keeps well, and is very reliable and convenient for use. For performing the operation of firing in a painless manner, this solution proves very useful. When injected along the course of the nerves its action is far more marked.

CHAPTER XIV

THE VEGETABLE KINGDOM (*continued*)

Belladonna.

Belladonnæ folia—Belladonna leaves.

The fresh leaves, with the branches to which they are attached, of *Atropa belladonna* (the deadly nightshade); also the leaves separated from the branches, and carefully dried.

DOSES.—Horses and cattle, $\bar{5}$ ii. to $\bar{5}$ ss.; dogs, grs. ii. to grs. v.

Belladonnæ radix—Belladonna root.

The dried root of *Atropa belladonna*. It contains from 0.3 to 0.8 per cent. of atropine.

Extractum belladonnæ viride—Green extract of belladonna.

This is prepared from the fresh leaves and young branches of *Atropa belladonna*.

DOSES.—Horses, $\bar{5}$ i. to $\bar{5}$ ii.; cattle, $\bar{5}$ ii. to $\bar{5}$ iii.; sheep, grs. x. to grs. xx.; dogs, gr. $\frac{1}{4}$ to grs. ii.

An alcoholic solid extract of belladonna and a liquid extract of belladonna are also prepared, containing a definite amount of alkaloid. Both of these extracts are prepared from belladonna root, and contain alcohol. They are more reliable than the green extract, which does not keep well, and is not definite in composition.

A liquid extract of belladonna, which is assayed so as to contain a definite amount of alkaloids, is now prepared, and is far more reliable than many of the ordinary extracts.

The dose of this preparation for the horse is from \mathfrak{M} xv. to $\bar{5}$ i., and for the dog from \mathfrak{M} ss. to \mathfrak{M} ii.

Tinctura belladonnæ—Tincture of belladonna.

PREPARED with 1 part of liquid extract of belladonna; diluted with alcohol to yield 15 parts. This is nearly double the alkaloidal strength of that formerly used. The tincture is most reliable when prepared with the standardised liquid extract mentioned above, 1 ounce of which is added to 14 ounces of alcohol (60 per cent.).

DOSES OF THE TINCTURE.—Horses, $\bar{3}$ ss. to $\bar{3}$ i.; cattle, $\bar{3}$ i. to $\bar{3}$ ii.; sheep, $\bar{5}$ ss. to $\bar{5}$ i.; dogs, \mathfrak{M} v. to \mathfrak{M} xv.

Glycerinum belladonnæ—Green extract of belladonna, 1 ounce; boiling distilled water, 1 drachm; rub together to form a smooth paste, and add glycerin, to make 2 ounces.

Unguentum belladonnæ—Belladonna ointment—8 parts of liquid extract evaporated to 1 part, and mixed with 9 parts of benzoated lard.

Linimentum belladonnæ—Liniment of belladonna.

Liquid extract of belladonna, 10 parts; camphor, 1 part; distilled water, 2 parts; alcohol (90 per cent.) q.s. to yield 20 parts.

Atropina—Atropine.

This is an alkaloid prepared from belladonna root, and on its presence the activity of belladonna depends. It is usually employed in the form of

Atropinæ sulphas—Atropine sulphate.

DOSES (*by hypodermic injection*).—Horses, gr. $\frac{1}{10}$ to gr. $\frac{1}{5}$; dogs, gr. $\frac{1}{200}$ to gr. $\frac{1}{100}$.

Liquor atropinæ sulphatis (B.P.)—Solution of atropine sulphate.

This contains atropine sulphate, 1 part; salicylic acid, $\frac{1}{8}$ part; and distilled water, 100 parts. The salicylic acid is added as a preservative agent.

DOSES (*for hypodermic injection*).—Horses, \mathfrak{M} xii. to \mathfrak{M} xxiv.; dogs, \mathfrak{M} i. to \mathfrak{M} ii.

A convenient solution for veterinary practice is prepared, containing 4 grains of atropine sulphate to the ounce of distilled water. Tablets and pellets containing accurate amounts of atropine sulphate can also be obtained.

ACTIONS OF BELLADONNA AND ATROPINE.

Externally, belladonna depresses the sensory nerve-endings, and diminishes the sensibility of sensory nerves, thus relieving pain and irritability in the part to which it is applied. It can be absorbed from the skin; but this process is greatly assisted if the drug be applied in combination with alcohol or glycerin, such as in the form of a liniment. If injected hypodermically, it exerts a local as well as a general anodyne effect. Locally applied to the udder in a state of activity, it arrests the secretion of milk by paralysing the lacteal nerve-terminations. It also checks secretion of sweat by a similar action on the secretory nerves of the sweat-glands. If applied to the eye, it causes dilatation of the pupil and paralysis of accommodation, this effect occurring whether the drug be applied locally or given internally.

Internally, moderate doses of belladonna produce dryness of the mouth, this depending on an arrest of the secretion of saliva, resulting from the specific action of the drug on the chorda tympani nerves—*i.e.*, it paralyses the secretory fibres of these nerves. Large doses cause excessive dryness of the mouth and throat and great difficulty in swallowing. In the stomach belladonna exerts slight anodyne effects, probably by depressing the terminations of the gastric nerves.

On the Nervous System, the action of belladonna is remarkable and complex. The primary effect of the drug is to stimulate the centres in the cerebrum, while at the same time it depresses, and in full doses paralyses, the terminations of motor nerves, and exerts special actions on certain nerve-terminations. In medicinal doses this primary exciting action is not observed, and the drug appears to have a sedative effect.

Full doses in man produce a peculiar form of delirium, in which restlessness and a desire for activity are combined with a feeling of lassitude, the latter effect depending on paralysis of the motor nerve-terminations.

In the horse, full doses cause excitement, delirium, and unsteady movement.

In the dog, the drug acts in a more marked manner on the heart than on the cerebrum.

On the Vital Centres in the Medulla, belladonna exerts a stimulating action. The respiratory centre and the vaso-motor centres are stimulated by medicinal doses, but are paralysed by toxic doses.

On the Spinal Cord, the primary effect is slight stimulation ; toxic doses paralyse this structure.

On Motor Nerves.—The terminations of motor nerves in voluntary muscles are paralysed.

The pulmonary terminations of the vagus are also paralysed ; but whether the drug produces a similar effect on the cardiac terminations of this nerve is a disputed point.

On Special Efferent Nerve-terminations.—It paralyses the terminations of the third cranial nerve (motor oculi) in the sphincter of the pupil and in the ciliary muscle, the result being dilatation of the pupil, paralysis of the power of accommodation, and, after large doses, increase of the intra-ocular pressure. According to some authorities, the sympathetic nerve is stimulated.

The terminations of the chorda tympani nerve in the submaxillary gland are paralysed, the result being an arrest of saliva and dryness of the mouth and throat.

It has a similar effect on other glands, such as the sweat-glands, the udder, and mucous glands, and probably also on the liver and pancreas.

Small doses depress the inhibitory fibres of the splanchnic nerves in the intestinal walls, and thus cause increased peristaltic action. Full doses, however, arrest peristaltic movements ; this is probably due to paralysis of the intestinal ganglia. It is said that the irritability of the intestinal muscular fibre is not interfered with.

On the Heart and Circulation, the exact manner in which belladonna acts is not clearly understood. In some cases the primary action of the drug is to produce slowness of the pulse-rate ; this may depend on stimulation of the vagus centre or of the terminations of the vagus in the heart (inhibitory apparatus).

The usual effect of the drug is to increase cardiac action and to raise blood-pressure. According to some authorities these effects depend on a depression or paralysis of the ends of the vagus, and on stimulation of the vaso-motor centres. Toxic doses completely paralyse the intra-cardiac ganglia and the vaso-motor centres, lower blood-pressure, and cause death by cardiac failure. Some authorities state that death occurs from asphyxia.

On Respiration.—Medicinal doses stimulate the respiratory centre, and cause more frequent and deeper respirations. They also arrest the bronchial secretions. Toxic doses paralyse this centre.

On voluntary muscles belladonna has little action, but large doses paralyse involuntary muscles.

On the Kidneys.—The secretion of urine may be increased, but toxic doses cause retention of urine by inducing paralysis of the bladder.

Atropine is rapidly excreted in the urine, and during its passage through the ureters, bladder, and urethra it exerts remote local anodyne actions thereon.

TOXIC ACTIONS.—In the horse, numerous experiments have demonstrated that large doses of belladonna or atropine produced restlessness, delirium, dryness of the mouth, quick pulse, gradually becoming thready, quick, short respirations, increase of temperature, dilatation of the pupils, but no hypnotic effects were observed. When the drug was administered in the crude form in large doses, symptoms of abdominal pain and loss of coordination in the hind extremities were present, in addition to the effects already mentioned. Six ounces of the dried root were stated by Hertwig to prove fatal in the horse.

Atropine sulphate, administered by hypodermic injection in doses of 2 grains, caused great acceleration and weakness of the pulse, twitching of the superficial muscles, nervous excitement, occasional hiccough, and dryness of the mouth. These symptoms gradually disappeared, but the pupils remained dilated for twenty-four hours.

In the dog, large doses of belladonna or atropine act in a

more marked manner on the heart than on the cerebrum. The symptoms observed are great rapidity of the pulse, which tends to become weak, also prostration, and death in convulsions. Paralysis of the vagi is said by some authorities to account for the phenomena in connection with the heart. The results of experiments would indicate that about $\frac{3}{4}$ grain of atropine is a toxic dose for the dog. Fifteen grains of the extract of belladonna have also proved fatal.

ANTIDOTES.—In the dog, if the case be seen early, prompt emetics should be administered. The hypodermic injection of apomorphine is the most reliable. Stimulants, such as brandy and ammonia, are indicated. The hypodermic injection of pilocarpine is recommended as a physiological antidote. Artificial respiration, the application of the hot and cold douche alternately to the head, and the judicious employment of the galvanic battery, are all of importance in the treatment of cases of belladonna poisoning.

As atropine is eliminated by the kidneys, and as retention of the urine is apt to occur in cases of poisoning by this agent, the catheter should be employed to relieve the bladder.

A case of poisoning is recorded in the dog as the result of the animal licking belladonna liniment which had been applied to the skin. The symptoms observed were a tendency to stumble over objects, interference with vision ; later on there was complete loss of muscular power in the hind-limbs, and the pulse and respirations were greatly accelerated. After the administration of stimulants the symptoms gradually disappeared in about four hours.

MEDICINAL USES.—In the treatment of *gastritis* in all animals belladonna is of service. Combined with bicarbonate of soda, it gives good results in cases of inflammation of the abomasum in cattle. It is recommended as an anodyne in cases of acute abdominal pain and in enteritis occurring in the horse. In our experience, its effects in moderate doses are of little value in such cases, and if larger doses be employed the exciting effects of the drug are produced.

Some practitioners combine atropine with morphine, and

state that it increases the anodyne effects of the latter, while overcoming some of its undesirable actions. This is not our experience.

Full doses of either belladonna or atropine interfere with the peristaltic action of the intestines, and hence are not suitable as anodynes in cases of colic depending on obstruction of the intestines.

In *pharyngitis* and *laryngitis*, belladonna, combined with potassium chlorate, glycerin, and honey, and administered in the form of electuary, gives good results. It relieves irritable cough, renders deglutition easier, and reduces the inflammatory condition of the affected parts.

In cases of *bronchitis* with excessive secretion, belladonna is useful, as it tends to overcome this condition; but in instances where the bronchial mucous membrane is already too dry it cannot be of any service, and is contra-indicated.

Powdered belladonna leaves form a frequent constituent of cough powders, but whether the agent exerts beneficial effects in all cases is doubtful, as cough is a symptom depending on a variety of conditions. If depending on irritation of the bronchi, we can easily understand the therapeutic value of the agent, as it reduces the irritability of the afferent and efferent nerves of these structures. Its action, however, in exciting the respiratory centre, while rendering it a safer agent than opium in irritable conditions of the respiratory organs, cannot be of advantage in all cases.

In cases of cardiac pain and palpitation, depending on certain forms of disease of the heart, belladonna appears to give relief by enabling the ventricles to empty themselves more frequently, and thus preventing distension of the heart.

In *tetanus*, the administration of belladonna in the form of electuary occasionally gives favourable results; but whether recoveries are to be attributed to the action of this agent or to the *vis medicatrix naturæ* is a matter of opinion. At any rate, it is a favourite drug in the treatment of this disease.

In irritable and inflamed conditions of the *bladder*, *rectum*, or *uterus*, the use of belladonna is indicated, and may be

given internally, as well as applied in the form of injections to the affected parts.

In constriction of the *cervix uteri*, which is met with in parturition cases, the extract of belladonna, freely applied to the part, overcomes the rigidity, and permits delivery to take place.

As an *antisialic*, belladonna is employed in cases of mercurial salivation. It is also useful as a mouth-wash in cases of inflammation of the tongue and buccal mucous membrane (see p. 415).

As belladonna in small doses tends to increase the peristaltic action of the intestines, it is sometimes combined with purgatives, and is found to assist their action and also to prevent griping.

Atropine is recommended as an antidote to morphine poisoning (see p. 252).

Externally, as a local anodyne, belladonna in the form of the extract, combined with glycerin, is extensively employed.

In punctured wounds of the feet, accompanied by pain and constitutional disturbance, belladonna freely applied to the coronet is useful in conjunction with other treatment.

In erysipelas and in acute painful conditions of *any part* the local application of belladonna is indicated.

In mammitis, belladonna, combined with glycerin, proves the best local application. It checks the secretion of milk, reduces inflammatory action, relieves pain and tension, and tends to arrest impending abscess.

In subacute cases of this affection it is best applied in the form of a liniment composed of belladonna extract, 2 drachms; glycerin, 2 ounces; and soap liniment, 3 ounces.

In affections of the eye, such as ophthalmia, keratitis, conjunctivitis, etc., atropine is employed in solutions varying from 2 to 4 grains to the ounce of distilled water.

A useful form of collyrium is prepared with atropine, 2 grains; cocaine, 2 grains; boric acid, 4 grains; and distilled water, 1 ounce.

By means of a drop-tube this lotion is applied to the eye as frequently as the circumstances of the case demand.

In using the ophthalmoscope, solutions of atropine are employed to dilate the pupil, and thus assist in carrying out the examination of the eye.

Care is necessary in applying belladonna externally in canine practice, as toxic symptoms may occur should the dog lick the parts (see p. 273).

Hyoscyamus.

Hyoscyami folia—Hyoscyamus leaves.

The fresh leaves, flowers, and branches of *Hyoscyamus niger*, or henbane; also the leaves and flowering tops, separated from the branches and carefully dried.

Extractum hyoscyami viride—Green extract of hyoscyamus.

A soft extract prepared from the juice expressed from fresh hyoscyamus leaves.

DOSES.—Horses and cattle, $\bar{\text{ʒ}}$ i. to $\bar{\text{ʒ}}$ iii.; dogs, grs. ii. to grs. viii.

A fluid extract of hyoscyamus, standardised, is also prepared.

DOSES.—Horses and cattle, $\bar{\text{ʒ}}$ i. to $\bar{\text{ʒ}}$ iii.; dogs, \mathfrak{M} ii. to \mathfrak{M} viii.

Tinctura hyoscyami—Tincture of hyoscyamus.

One part of hyoscyamus leaves and flowering tops percolated with alcohol to yield 10 parts (1 in 10).

DOSES.—Horses and cattle, $\bar{\text{ʒ}}$ i. to $\bar{\text{ʒ}}$ ii.; dogs, \mathfrak{M} x. to \mathfrak{M} xl.

Hyoscyamine and hyoscine are two alkaloids contained in hyoscyamus. They are not employed in veterinary practice. In human medicine they are prescribed in the form of hyoscyamine sulphate and hyoscine hydrobromide.

ACTIONS AND USES—Hyoscyamus resembles belladonna in its actions, but is believed to possess certain advantages over the latter. The secondary calmative action on the cerebrum is more marked than that of belladonna, this depending on the presence of hyoscine. Its carminative and laxative effects are more pronounced than those of

belladonna, and it possesses more decided, remote local anodyne effects on the urinary organs.

In cases of irritability of the bladder and genito-urinary organs, hyoscyamus is prescribed in combination with alkalies such as bicarbonate of potassium or sodium.

In cystitis and in cases of strangury arising from the absorption of cantharidin from the application of a blister, hyoscyamus is prescribed, with alkalies and demulcents (see p. 528).

In canine practice it is combined with purgatives to prevent griping and to assist their action. For example, it is combined with compound colocynth pill to form the pil. colocynthidis composita et hyoscyami (see p. 344).

Stramonium.

Stramonium—The dried leaves and seeds of *Datura stramonium*, the thorn-apple. Its alkaloid is daturine.

The preparations in use are the tincture and the extract.

Stramonium resembles belladonna in its actions. It is said to possess a more marked depressant effect on the nerves of the bronchi than the latter drug, and in human practice is found useful in the treatment of asthma. It is seldom employed in veterinary practice.

Duboisine.

Duboisine is an alkaloid obtained from the *Duboisia myoporoides*, an Australian plant.

It resembles belladonna and hyoscyamus in its actions, and acts more promptly than atropine in causing dilatation of the pupil.

The sulphate of duboisine is employed in human ophthalmic practice as a mydriatic.

Tobacco.

Tabaci folia—Leaf tobacco.

The dried leaves of the Virginian tobacco, *Nicotiana tabacum*. Contains about 6 per cent. of nicotine.

Nicotina—Nicotine.

A colourless, volatile, liquid alkaloid obtained from tobacco. Tobacco-smoke only contains the smallest traces of nicotine, but a number of volatile bodies are present, chiefly compounds of pyridine, which are less toxic than nicotine. It is also said to contain gases, such as carbon monoxide and hydrocyanic acid.

ACTIONS AND USES.—Tobacco is a powerful depressant, especially to the heart and circulation. It is also a gastrointestinal irritant, and produces nausea, colicky pains, increased action of the bowels and kidneys, and in the dog vomition. Decoctions of tobacco applied to the skin of dogs may cause toxic effects by absorption. On the nervous system tobacco at first exerts a stimulating action, but this is quickly succeeded by marked depression. It first stimulates the vagus roots and their cardiac terminations, and then depresses and finally paralyzes them. The spinal cord is at first stimulated, and subsequently paralysed. Death is preceded by convulsions, and is due to asphyxia, depending on paralysis of the respiratory centre. Tobacco causes contraction of the pupils and increases most secretions, thus differing in a marked degree from belladonna and its allies.

Nicotine is a very powerful poison. From 5 to 6 minims are said to prove toxic to the horse, and from 1 to 3 minims to the dog; if given hypodermically, one-tenth of these doses may prove dangerous.

In the *Journal of Comparative Pathology and Therapeutics*, December, 1904, Mr. G. Livesey, M.R.C.V.S., records an interesting case of tobacco-poisoning in the dog. The animal, a large fox-terrier, was given half an ounce of plug tobacco as a vermicide. 'In twenty minutes violent straining occurred, but no action of the bowels; the animal vomited the tobacco, and convulsions ensued. All the muscles were in a state of clonic spasm, especially the masseters and those of the neck and abdomen. The membrana nictitans almost obscured the eye, the eyeball was retracted, the pupil was contracted to a marked degree. The mucous membranes were rather pale and of a bluish tinge, the pulse was quick, the respirations deep

but not accelerated in proportion to the pulse, the extremities were cold, the skin was tense, the nose cold but dry, deglutition was impossible. Signs of collapse appeared: the body was cold, the respirations shallow, the heart slow and feeble; the animal lost the use of all his limbs, which hung limp and paralysed when he was raised from the ground; occasionally slight convulsions appeared, and the muscles of the right shoulder showed a persistent tremor. Bromide of potassium was administered, and afterwards strychnine. The pulse improved after the strychnine, and the convulsions ceased, after lasting for five hours. After the administration of diluted alcohol the animal vomited a brown-stained liquid smelling of tobacco and mixed with a small amount of blood. Next day the dog had recovered completely.'

The ANTIDOTES recommended for tobacco-poisoning are, in the dog, emetics, preferably apomorphine, followed by tannic acid or strong tea. The hypodermic injection of strychnine, also stimulants such as alcohol and sal volatile, are to be given freely. The surface of the body should be kept warm.

Tobacco is not used internally in the present day. Nicotine has been tried in the treatment of tetanus, but not with satisfactory results. As a parasiticide, decoctions of tobacco were at one time employed in the treatment of mange, and for the destruction of lice, ticks, and fleas, but other agents have been found safer and more effectual. Tobacco in the form of an infusion, prepared with 4 ounces in a pint of boiling water, then cooled and strained, has been found successful as an antidote to strychnine-poisoning in the dog, and may be employed in a case of emergency when other antidotes are not at hand.

Lobelia.

Lobelia—the dried flowering herb of *Lobelia inflata*, also known as Indian tobacco—resembles tobacco in its actions. It is seldom used in veterinary practice. In human practice it is employed in the form of tincture in the treatment of spasmodic asthma.

Conium.

Conium—The fresh leaves and young branches, also the unripe fruit, dried, of *Conium maculatum*, or hemlock.

The preparations of this drug are an extract, an expressed juice or succus, and a tincture. The alkaloid is conine, which is a very active poison. Conium is seldom used in veterinary practice. Its chief action is exerted on motor nerves, which it paralyzes from their extremities upwards. Large doses paralyze the motor centres of the cerebrum, and also paralyze the respiratory centre, causing death from asphyxia. Applied locally, it depresses and paralyzes the terminations of sensory nerves.

The symptoms observed in cases of poisoning by this agent were muscular weakness, drooping and swollen eyelids, dilatation of the pupils, and general paralysis.

The ANTIDOTES recommended are tannic or gallic acid, or decoction of oak bark, stimulants—brandy, whisky, etc.—warm clothing, hand-rubbing, etc. Some authorities advise the hypodermic injection of atropine.

At one time conium was prescribed in cases of tetanus and in the treatment of spasmodic cough, but proved of little, if any, use. It is now seldom used in veterinary practice.

Curare.

Curara—Curare.

The South American Indian arrow poison, produced from species of strychnos and other plants. It contains an alkaloid, curarine. Curare paralyzes the peripheral ends of motor nerves, and in large doses paralyzes the vagus, the ends of the sensory nerves, and the spinal cord. It causes death by paralysis of the respiratory muscles. If given by the mouth it is uncertain in its actions, as it is rapidly eliminated, but administered hypodermically it is a powerful poison. It has been tried in the treatment of tetanus, but with little success, and is not employed in veterinary practice.

Calabar Bean.

Physostigmatis semina—Calabar bean.

The ripe seeds of *Physostigma venenosum*. Its chief constituent is a crystalline alkaloid, physostigmine, also known as eserine. It also contains calabarine, which resembles strychnine in its actions. An extract and a tincture are prepared, but the alkaloid physostigmine is of chief importance in veterinary practice. The following salts are employed:

Physostigminæ sulphas—Physostigmine sulphate; eserine sulphate.

Physostigminæ salicylas—Physostigmine salicylate; eserine salicylate.

The doses of each are similar—viz., horses and cattle, gr. i. to gr. ii., by hypodermic injection. If administered by intratracheal injection, the smaller dose should be employed. It is not used internally in canine practice.

ACTIONS.—*Externally*, a solution of physostigmine exerts no topical action on the skin or mucous surfaces, but in a concentrated form the drug is said to partially paralyse sensory nerves. Applied to the conjunctiva, it is readily absorbed, and causes contraction of the pupil.

A medicinal dose of physostigmine—*i.e.*, from 1 grain to $1\frac{1}{2}$ grains—administered hypodermically, exerts prompt actions on the gastro-intestinal canal. These consist of energetic contractions of the involuntary muscular fibres of the stomach, but chiefly of the intestines, resulting in increased peristaltic action and free evacuation of fæces in a short period of time. The drug causes also an increased secretion of fluids from the intestinal walls. On the above actions depends the utility of this agent in equine practice.

On the Nervous System.—Toxic doses of physostigmine paralyse the nervous centres, but appear to have little effect on the cerebrum, as consciousness is not impaired. The medulla is paralysed, and death results from asphyxia, due to paralysis of the respiratory centre. This occurs before

the reflex action of the spinal cord is destroyed. Some authorities state that death is due to cardiac paralysis. The spinal cord is specially acted on by physostigmine. The inferior cornua are first depressed and then paralysed, the result being motor paralysis and loss of reflex irritability. The superior cornua are next paralysed, the result being complete paralysis of the spinal cord.

On the Circulation.—Physostigmine in small doses contracts arterioles, and reduces the force and frequency of the heart's action. The blood-pressure is raised, but falls later on. According to some authorities, the cardiac centre and also the intracardiac branches of the vagus are stimulated; this is followed by depression of the same structures. The cardiac muscular fibre is stimulated, and in large doses the drug causes marked contraction of the ventricles.

On Respiration.—Respiration is at first accelerated and then retarded. This may depend on spasm of the bronchial tubes, or on stimulation of the pulmonary terminations of the vagi.

On Muscles.—Moderate doses have little effect on the voluntary muscles, but they cause contraction of involuntary muscular fibre throughout the body. This is due to a direct action of the drug, and not through the agency of the nerves. The stomach, intestines, bladder, and uterus are contracted, with expulsion of their contents. Large doses produce twitching of the voluntary muscles, particularly those in the region of the elbow and stifle.

On Secretion.—The secretions of all glands are increased by physostigmine. This increased secretion depends on a special action of the drug on the secreting cells, thus differing from nicotine or pilocarpine, which produce this effect by acting on the ends of secretory nerves.

On the Eye.—Physostigmine, whether applied locally or given internally, causes contraction of the pupil. This may depend on stimulation of the fibres of the third cranial nerve, or on stimulation of the circular muscular fibres of the iris. It also diminishes intra-ocular pressure, and causes spasm of accommodation.

In the horse, the action of physostigmine on the gastrointestinal canal is usually prompt and constant. The average medicinal dose, from 1 grain to $1\frac{1}{2}$ grains, administered by hypodermic injection, generally acts in from twenty minutes to an hour. If given by intratracheal injection its effects are much quicker. Slight colicky pains, loud intestinal murmurs, and the passage of flatus, are the first indications of its action; these are followed by evacuation of the contents of the rectum, and succeeded at intervals by motions which are softer and more watery in consistence. The colicky pains may continue, and, in addition, there may be straining, especially if the dose be too large, or if a firm obstruction is present in the intestine. The symptoms pass off in from two to two and a half hours, and in favourable cases a very large amount of fæces will have been excreted.

The action of physostigmine is believed to be specially exerted on the large intestine, and if combined with pilocarpine its effects are more marked and reliable.

Toxic doses cause profuse sweating, convulsive breathing, and in some cases spasm of the diaphragm. Death has occurred in the horse after the administration of 8 grains hypodermically.

ANTIDOTES.—Atropine is a physiological antagonist to physostigmine, and is advised as an antidote. Choral is also recommended. In cases showing evidences of collapse strychnine should be given hypodermically and stimulants freely administered.

MEDICINAL USES.—The chief use of physostigmine in veterinary practice is in the treatment of cases of colic in the horse depending on obstruction of the intestine with fæces, which ordinary remedies fail to overcome; also in cases of impaction of the colon, with paralysis of its walls (see p. 459).

In properly selected cases it is an agent of great therapeutical value; but it is important to remember that if the intestinal obstruction depends on other causes, such as volvulus, intussusception, hernia, etc., the action of the drug hastens the fatal termination.

In cases of intestinal calculus, physostigmine fails to remove the obstruction, and is likely to produce rupture of the intestine. In cases which give evidences of the presence of enteritis this drug is also contra-indicated (see p. 464).

In spite of all precautions, however, errors of diagnosis will occur in connection with abdominal affections. Hence we meet with some cases in which after-events prove that the drug would have been of service, and others in which we learn when too late that by administering this agent we have accelerated death.

In the case of pregnant animals the employment of physostigmine may cause expulsion of the fœtus; but if the mother's life is of more importance, we should not hesitate to prescribe this agent, provided that the indications for its use are present.

In cattle, physostigmine does not give satisfactory results, as, although it causes painful straining, it does not produce free purgation.

Externally, physostigmine is employed in certain affections of the eye, such as ulceration of the cornea, glaucoma, and staphyloma. Used alternately with atropine, it is useful to prevent and to break down adhesions after iritis. The usual solution employed for these purposes is prepared with 2 grains of physostigmine sulphate to 1 ounce of distilled water.

The most convenient form for dispensing solutions of physostigmine is found in the hypodermic pellets, which are supplied by chemists. The usual dose for producing desired results is 1 grain, and if this be combined with 2 or 3 grains of pilocarpine the effect is more pronounced. If 1 grain fails to exert a purgative effect, it is advisable to administer a larger dose in about two hours, and up to 2 grains may be given with safety.

Jaborandi.

Jaborandi folia—Jaborandi leaves.

The dried leaflets of *Pilocarpus jaborandi*.

The principal alkaloid is pilocarpine, and on this the activity of the drug depends.

Some authorities state that an alkaloid known as jaborine is also present, which resembles atropine in its actions and is antagonistic to pilocarpine.

Tinctura jaborandi—Tincture of jaborandi.

Four parts of jaborandi leaves, percolated with alcohol to yield 20 parts (1 in 5).

DOSES.—Horses, $\bar{3}$ i. to $\bar{3}$ ii.; dogs, $\bar{5}$ ss. to $\bar{5}$ i.

Pilocarpinæ nitrās—Pilocarpine nitrate.

The nitrate of an alkaloid, pilocarpine, obtained from jaborandi leaves.

DOSES.—Horses, grs. ii. to grs. iii.; dogs, gr. $\frac{1}{20}$ to gr. $\frac{1}{3}$, administered by hypodermic injection.

ACTIONS OF PILOCARPINE.

Externally, if applied to the conjunctiva, it causes contraction of the pupil and spasm of accommodation, this action being due to stimulation of the peripheral endings of the third cranial nerve. This stimulant action may terminate in depression, and slight dilatation may be induced.

Internally, it has *two* important actions. First, it stimulates the peripheral ends of the efferent nerves, going to glands—*i.e.*, the secretory nerves—and thus increases most secretions. In the next place, it stimulates the nerves supplying involuntary muscular fibre. Thus, by stimulating the terminations of the third cranial nerve, it causes contraction of the pupil, and by stimulating the intestinal ganglia it causes increased peristaltic action. It also stimulates the cardiac terminations of the vagus, producing a slow pulse and a fall in blood-pressure.

The action of pilocarpine on the secretion of glands is very marked. It produces copious secretion from the salivary and lachrymal glands, the mucous glands of the mouth, throat, nose, and deeper respiratory passages, the gastric secretory glands, the pancreas, and probably the intestinal glands. This increased activity of the glands is accompanied by dilatation of their vessels.

In man the sweat-glands are stimulated to a marked extent, the result being profuse diaphoresis. This effect is not observed in animals, and in the horse only a slight moisture of the skin may be present.

The secretion of saliva, however, is very copious, and salivation may occur in from five to six minutes after a dose of 3 grains of the drug administered hypodermically. This action is accompanied by champing of the jaws, usually continuous for two hours. The bile, urine, and milk are not affected directly by the drug.

It is not yet definitely settled whether pilocarpine increases intestinal secretion. The fluid character of the fæces would indicate that the intestinal glands are stimulated.

On the Circulation.—The action of pilocarpine is complex. The primary action of the drug is to stimulate the cardiac terminations of the vagus. This produces a slow pulse and a fall of blood-pressure. The inhibitory fibres, however, soon become depressed; the heart tends to resume its normal rate; but the cardiac muscle is directly acted on, and the vaso-motor centres are depressed, so that the cardiac contractions become weak and slow.

In some instances the primary stimulation of the inhibitory fibres is absent, and acceleration of the pulse with increased blood-pressure is produced. The acceleration of the blood-current through the glands which accompanies this increased activity is probably not due to a direct action of the drug on the vessels, as a similar result will follow any stimulation of glandular structures.

On Respiration.—Toxic doses produce asphyxial dyspnœa; this occurs not only from changes in the circulation which lessen the amount of blood passing through the lungs, but also from pulmonary œdema depending on abundant secretion into the bronchi, the result of stimulation of the bronchial secretory glands. Some authorities believe that the pulmonary œdema results from inefficiency of the circulation in the lungs. The temperature is said to be reduced after pilocarpine has exerted its actions.

ANTIDOTES.—Atropine is physiologically antagonistic to pilocarpine, and hence is a suitable antidote. It may be administered hypodermically. The tincture of belladonna given by the mouth is said to be equally effective as an antidote.

MEDICINAL USES.—The chief use of pilocarpine in veterinary practice is in the treatment of intestinal impaction. For this purpose it is combined with physostigmine, and it assists the action of the latter. As pilocarpine does not produce sudorific effects in animals, its therapeutic value is limited, and it is not found of service in the treatment of renal dropsy or of uræmia, instances in which it proves useful in human medicine. The drug is not used internally in canine practice. It is believed to lessen vascular tension in the eye, and is occasionally employed in acute inflammatory affections of this organ in the form of eye-drops, the strength being 2 grains to the ounce of distilled water.

Gelsemium.

Gelsemii radix—Gelsemium root.

The rhizome and roots of *Gelsemium nitidum*.

Gelsemium contains an active alkaloid, gelseminine. Gelsemium resembles conine in some of its actions. It is an antispasmodic and an analgesic, and in the form of tincture may be combined with chloral hydrate and bromides as a cerebral sedative. It is seldom prescribed in veterinary practice.

Ergot.

Ergota—Ergot.

A parasitic fungus, the *Claviceps purpurea*, which grows on the rye (*Secale cornutum*, or *cereale*), and occasionally on other kinds of grain. It contains an alkaloid, cornutine; a nitrogenous acid of glucosidal nature, ergotinic acid; and a resinous acid not containing nitrogen—viz., sphacelinic acid.

DOSES OF POWDERED ERGOT.—Horses and cattle, ʒss. to ʒi.; sheep, ʒi. to ʒi.ss.; dogs, grs. xv. to grs. xx.

PREPARATIONS.

Extractum ergotæ liquidum—Liquid extract of ergot. (1 part is equivalent to 1 part of ergot—1 in 1.)

DOSES.—Horses and cattle, ʒii. to ʒvi.; sheep, ʒss. to ʒi.; dogs, ʒv. to ʒxx.

A fluid extract, standardised physiologically, is also prepared. This is very reliable, and is prescribed in similar doses to the above.

Extractum ergotæ—Extract of ergot; ergotin.

DOSES.—Horses and cattle, ʒss. to ʒi.; sheep, grs. xv. to grs. xx.; dogs, grs. ii. to grs. vi. It should be remembered that ergotin is *not an alkaloid*, but simply a soft extract of ergot.

Injectio ergotæ hypodermica—Hypodermic injection of ergot, or hypodermic injection of ergotin.

This is prepared with 10 parts of ergotin, 0·3 of phenol, and distilled water q.s. to make 30 parts. It should be freshly prepared for use. 3·3 minims are equivalent to 1 grain of ergotin.

DOSES (*by hypodermic injection*).—Horses and cattle, ʒi. to ʒi.ss.; sheep, ʒx. to ʒxx.; dogs, ʒiii. to ʒx.

A special preparation for hypodermic injection is manufactured by Messrs. Parke, Davis and Co., London, and is termed 'Ergot aseptic.' It is supplied in hermetically-sealed bulbs, and is thus free from germ infection. It is said to be free from extractive matter and from ergotinic acid (the latter being an undesirable constituent of ergot), and is standardised physiologically. Each bulb contains 1 c.c., and is equivalent to 30 grains of ergot. This preparation is very useful in canine practice, but is too expensive for use in horses and cattle.

ACTIONS.—In consequence of the constituents entering into its composition, the action of ergot is complex. Cornutine is stated to exert special actions which are distinct from those of the other constituents. It produces contraction of the muscles by a direct action on the muscular fibres.

Toxic doses cause in the dog salivation, vomiting, and

purging. The pulse is rendered slow and irregular, and clonic convulsions occur, death resulting from cessation of respiration. These effects are believed by some authorities to depend on some action of the drug on the central nervous system, probably stimulation, succeeded by depression and paralysis of the centres. Powerful contractions of the stomach intestines and uterus are produced by cornutine, and it appears likely that the vomiting and purging are due to a direct action on the muscular coats of the stomach and intestines.

Sphacelinic acid depends for its activity on a toxic resinous body named *sphacelotoxin*. It has a special action on the arterioles, consisting of a prolonged contraction leading to a hyaline formation in the lumen and walls; this obstructs the circulation through them after relaxation occurs. The result is the production of dry gangrene, especially of the extremities; this is said not to occur in the dog, but is met with in cattle, horses, and pigs which are fed on fodder contaminated by ergot. The constriction of the arterioles is believed to depend on a direct action exerted on the muscular walls of the vessels, and also from stimulation of the vaso-motor centre. *Sphacelinic acid* has been found to produce abortion in pregnant animals, some authorities believing that this effect is due to a direct action on the uterine muscular fibres producing contractions of this organ. Others believe that this agent induces uterine contractions by acting on the uterine centres in the spinal cord.

Ergotinic acid is an undesirable constituent of ergot, as it acts chiefly as a depressor to the spinal cord, the vaso-motor centres, and the brain, and may induce collapse.

The alkaloid of ergot—viz., cornutine—has not proved satisfactory as a therapeutic agent.

In the condition known as ergotism—i.e., poisoning as the result of ergot being taken into the system—two groups of symptoms may be observed. These may be described as the *gangrenous* and the *convulsive*. The former is due to the action of sphacelotoxin on the bloodvessels. The latter is

believed by some authorities to depend on the action of cornutine on the nervous system.

The action of ergot on the uterus, which is the most important one from a therapeutical point of view, is not definitely explained. Most authorities state that the drug induces movements similar to those occurring in normal parturition. Whether the uterine contractions depend on a direct action on the uterus itself, or indirectly from the action of the drug on the nervous centres, is not yet definitely known. Very large doses may produce a marked tonic contraction of the organ.

TOXIC EFFECTS.—Dogs are more susceptible to the action of ergot on the nervous system than horses or cattle.

Ergotised grasses produce abortion in cows and ewes, especially in wet seasons.

Hay from ergotised pastures, being usually cut before the fungus is matured, is not so liable to cause toxic effects as the grass from such pastures.

Dry gangrene, as the result of ergotism, chiefly affects the extremities, ears, and tail. The nervous phenomena consist of convulsive twitchings, spasms, convulsions, and finally paralysis and coma. These effects are believed to depend on irritation of the sensory centres of the spinal cord, succeeded by paralysis of this structure.

ANTIDOTES.—The antidotes recommended are the inhalation of amyl nitrite and the administration of nitro-glycerine. Stimulants, such as alcohol, chloric ether, etc., are indicated, and treatment should be commenced with the administration of an oleaginous laxative.

MEDICINAL USES.—In cases of parturition, when the labour pains seem weak and insufficient, the administration of ergot is indicated. This condition is seldom met with in the mare or cow, but occurs at times in the bitch. Before employing ergot for this purpose, the practitioner should satisfy himself that *no obstruction to delivery is present*, such as an abnormal presentation, a contracted pelvis, or excessive rigidity of the os uteri. Small doses should be given, so as to avoid inducing tonic contraction of the uterus. In

unsuitable cases, such as those mentioned, the employment of ergot might cause the death of the foetus from constriction of the bloodvessels, or might produce rupture of the uterus.

The chief value of ergot is in the treatment of *post-partum* hæmorrhage. In such cases it produces desired results by promoting contraction of the uterus, and to a lesser degree by contracting the bloodvessels of this organ.

In other forms of internal hæmorrhage, such as from the stomach, intestines, kidneys, and lungs, ergot is administered with the idea that by contracting the walls of the bloodvessels it will arrest the hæmorrhage. The therapeutic value of ergot in such cases is doubtful, as it is hardly likely to exert a special action on the ruptured vessel or vessels without at the same time causing contraction of the bloodvessels throughout the system. The result of the latter action would be to raise the general blood-pressure, and thus to favour hæmorrhage from the ruptured vessels.

Ergot is administered in cases of retention of the placenta, and by promoting contraction of the uterus, it is believed to facilitate expulsion of the foetal membranes. It thus forms a constituent of 'cleansing' drenches, which usually contain powdered ergot, sulphate of magnesia, and ammonium carbonate. This combination is administered in warm ale and treacle, and in ordinary cases appears to produce desired results in cows, if we are to judge by the demand for this form of medicine.

In consequence of the tendency of ergotin to produce irritation, it should be injected deeply into a muscle, and not into the subcutaneous tissue.

Preparations of ergot often vary in strength, and it is difficult to ascertain the exact dose to fulfil desired results. For this reason it is of importance to use a standardised preparation of the drug.

The intravenous injection of ergot and normal saline solution has been suggested for the treatment of surgical shock in man by Mr. Lockhart Mummery, F.R.C.S. (*Lancet*, April 1, 1905).

Experimentally, ergot has been found to raise blood-pressure to a marked degree, and to sustain it at a high level for a considerable time. This effect could only be obtained in the cat. In the dog no result of this kind could be observed after injections of ergot, even with large doses.

Nux Vomica.

Nux vomica.

The dried ripe seeds of *Strychnos nux vomica*.

DOSES OF POWDERED NUX VOMICA.—Horses, gr. xx. to ʒi.; cattle, ʒi. to ʒii.; sheep, grs. x. to grs. xx.; dogs, gr. ss. to grs. iii. Repeated twice daily. It contains from 0·7 to 1·5 per cent. of strychnine.

Extractum nucis vomicæ liquidum—Liquid extract of nux vomica.

This is standardised to contain 1·5 per cent. of strychnine.

DOSES.—Horses, ʒxx. to ʒi.; cattle, ʒi. to ʒii.; sheep, ʒx. to ʒxx.; dogs, ʒss. to ʒiii.

Extractum nucis vomicæ.

A solid extract prepared from the liquid extract of nux vomica, and standardised to contain 5 per cent. of strychnine.

DOSES.—Horses, grs. v. to grs. xx.; cattle, grs. x. to grs. xxv.; sheep, grs. ii. to grs. v.; dogs, gr. $\frac{1}{8}$ to gr. $\frac{1}{6}$.

Tinctura nucis vomicæ—Tincture of nux vomica.

Prepared with liquid extract of nux vomica, 2 parts; distilled water, 3 parts; and alcohol (90 per cent.), q.s. to yield 12 parts. It contains about 0·25 per cent. of strychnine. One ounce of the tincture is equivalent to about 1 grain of strychnine.

DOSES.—Horses, ʒii. to ʒi.; cattle, ʒi.; sheep, ʒxv. to ʒi.; dogs, ʒii. to ʒx.

Strychnina—Strychnine.

An alkaloid obtained by a complex process from the seeds of *Strychnos nux vomica*.

The salts of strychnine used are the *hydrochloride* and the *sulphate*.

Strychninæ hydrochloridum—Strychnine hydrochloride.

DOSES.—*By the mouth*: Horses, gr. ss. to grs. ii.; cattle,

grs. ii. to grs. iii.; sheep, gr. $\frac{1}{4}$ to gr. ss.; dogs, gr. $\frac{1}{60}$ to gr. $\frac{1}{20}$. For hypodermic injection the minimum doses should be given.

Liquor strychninæ hydrochloridi—Solution of strychnine hydrochloride—is composed of strychnine hydrochloride, $17\frac{1}{2}$ grains; alcohol (90 per cent.), 1 fluid ounce; distilled water, q.s. to yield 4 fluid ounces (1 in 100). Eleven minims are equivalent to $\frac{1}{10}$ grain of strychnine hydrochloride.

DOSES.—*By the mouth*: Horses and cattle, ʒi. to ʒii.; sheep, ʒxx. to ʒxxx.; dogs, ʒi. to ʒv.

By hypodermic injection: Horses and cattle, ʒi.; sheep, ʒxx.; dogs, ʒi. to ʒii.

The doses of strychnine should be computed according to the size of the patient and the requirements of the case; it is safer to commence with the minimum dose and to gradually increase. As the drug is *cumulative* in its action, the effects should be carefully watched, especially in dogs.

Incompatibles of strychnine: alkalies and alkaline carbonates, bromides and iodides, liquor arsenicalis.

The liquor strychninæ should not be prescribed along with iodide of potassium, as an insoluble iodide may be thrown out. When it is desirable to combine liquor strychninæ with arsenic, the (acid) liquor arsenici hydrochloricus should be used instead of the liquor arsenicalis. It is not safe to dispense liquor strychninæ with alkaline solutions, as the alkaloid may become deposited in the mixture, and the last dose may prove toxic. When prescribed along with potassium bromide, the latter should be acidulated with hydrobromic acid, for a similar reason.

The sulphate of strychnine is administered in similar doses to the hydrochloride. For accuracy and convenience in preparing hypodermic injections of strychnine, chemists supply pellets containing from gr. ss. to gr. i. for the horse, and gr. $\frac{1}{60}$ to gr. $\frac{1}{30}$ for the dog.

Brucine is another alkaloid found in nux vomica; it resembles strychnine, but is far less active. It is not used medicinally.

ACTIONS OF STRYCHNINE AND NUX VOMICA.

In medicinal doses strychnine and nux vomica act as vegetable bitters, improving the appetite and assisting digestion. They also act as nervine tonics, increasing the activity of the central apparatus, regulating the movements of the intestine, and overcoming constipation. They are general stimulants to the nervous system, and improve most of the nutritive functions, increase contraction of the blood-vessels, and produce greater activity of the muscles.

Strychnine is rapidly absorbed from mucous surfaces, from abrasions of the skin, and from the cellular tissue, when administered by hypodermic injection. When given by the mouth, the drug is said to be absorbed chiefly from the small intestines.

On the Spinal Cord.—The specific action of strychnine is exerted on the spinal cord. Toxic doses stimulate the motor cells of this structure and produce tetanic convulsions. The exact region in the cord on which the drug acts is not known; some authorities believe that it increases the excitability of the region between the sensory roots and the motor cells. The reflex excitability of the cord is enormously increased, so that the slightest sound or touch is sufficient to bring on the characteristic convulsions. Some authorities believe that the convulsions depend on some stimulus from without, which may be very slight or imperceptible. The movements induced by the first shock are said to lead to secondary stimuli, arising from the movements of the joints and tendons. The convulsions resemble to a certain extent those occurring in tetanus, but differ from the latter in having periods of complete relaxation, and in affecting the muscles of the body generally, so that the tonic spasm of the muscles of the jaw, known as trismus, is not specially marked in strychnine-poisoning. The stimulation of the spinal cord is succeeded after a time by depression and paralysis, the sensory portions being first affected, and afterwards the motor areas. The medullary centres are

also stimulated by strychnine. There is little or no action on the cerebrum, and consciousness is not interfered with.

On respirations special effects are produced. The respiratory centre is stimulated, and the respirations are rendered deeper and more frequent.

Toxic doses may arrest respiration by causing violent contraction of the diaphragm and the other respiratory muscles during a convulsion, and after a very large dose of the drug this effect may be quickly produced. In other cases the respirations gradually become slower and shallower as paralysis of the respiratory centre proceeds.

On the Circulation.—Strychnine has no direct action on the heart. It stimulates the vaso-motor centres and contracts the peripheral arterioles. Small doses stimulate the inhibitory centre, slow the heart's action, and raise the blood-pressure. Toxic doses are said to dilate the cutaneous bloodvessels and to cause constriction of the internal vessels, so that the blood is diverted to the skin and limbs.

Strychnine increases oxidation and augments the excretion of carbon dioxide. It is eliminated very *slowly* from the system, and chiefly by the kidneys; it may be found in the urine up to eight days after the last dose has been administered. Even when given by hypodermic injection, it can be detected in the stomach. Strychnine is cumulative in its action (see p. 46), and this is believed to depend on the contraction of the renal arteries which it induces, thus interfering with its excretion. This is an important point to remember when prescribing the drug. No tolerance is acquired to the action of strychnine (see p. 46).

Toxic Effects.—Strychnine-poisoning is very frequently met with in canine practice. The drug is a favourite constituent of rat-pastes and vermin-killers, and is often employed to 'poison' lands for the purpose of preventing the trespass of dogs. Accidents from these sources, as well as the malicious use of the agent, have proved very fatal to dogs. When administered for therapeutical purposes, toxic symptoms are sometimes observed, depending on either too large

a dose of the drug, its cumulative action, or a special susceptibility of the patient.

The toxic dose for the dog is stated to be from $\frac{1}{6}$ to $\frac{1}{3}$ of a grain, but smaller amounts may produce the characteristic symptoms. For the horse, from 3 to 6 grains given hypodermically have proved toxic. The symptoms observed are laboured respiration, accelerated pulse, abdominal pain, excitement, and violent tetanic spasms when the surface of the body is touched.

The symptoms in the dog vary in severity according to the amount of the drug taken. A large dose may cause death after two or three convulsions, as the breathing becomes arrested by violent contraction of the diaphragm and other respiratory muscles. A smaller dose may produce shorter convulsions and longer intervals of quiescence, with gradual lessening of reflex irritability, and death from asphyxia. During the convulsions the head is drawn backwards, and the fore and hind limbs are extended; all the muscles of the body are involved, but the action of the extensors generally prevails over the others. At the commencement of the convulsions tremors or involuntary twitchings occur in the limbs, and the muscles feel hard and firm. Immediately after a convulsion the muscles relax, prostration occurs, the respirations become more regular; but a second convulsion quickly follows on the first.

Nux vomica in the form of powder is of variable strength, and large doses may be taken by horses without apparent ill-effects. To large cart-horses, 1 ounce of powdered *nux vomica* may be prescribed in cases of intestinal obstruction depending on paralysis of the intestines, and to horses of smaller size $\frac{1}{2}$ ounce may be given with benefit (see p. 459).

Post-mortem Appearances.—Besides the usual post-mortem appearances of asphyxia, congestion of the cerebral and spinal meninges is observed, and occasionally patches of congestion are found in the intestines.

ANTIDOTES.—In the dog, emetics should be administered as soon as possible. The most reliable emetic is apomorphine, administered hypodermically, the dose being from $\frac{1}{15}$ to $\frac{1}{10}$

grain, or 5 minims of the 1 in 50 solution. The treatment in cases of strychnine-poisoning must be prompt to be effectual; indeed, once the drug has become absorbed and exerts its action on the nervous system, emetics are of little value; besides, the vomited material may enter the trachea during a convulsion and prove dangerous. Antidotes administered by the mouth should be given between the convulsions. Bromide of potassium, $\frac{1}{2}$ ounce, with chloral hydrate, 30 grains, should be given in solution, and 2 drachms of the former with 10 grains of the latter may be given every fifteen or twenty minutes if necessary. The inhalation of chloroform so as to produce light anæsthesia is useful to combat the convulsions; it is easy of administration, and can be discontinued if symptoms of paralysis appear.

Other antidotes recommended are nitrite of amyl inhalations, animal charcoal, tannic acid, curare (gr. $\frac{1}{3}$ by hypodermic injection). In cases of emergency, tobacco may be given (see p. 279). Morphine has also been tried with success (p. 256).

As a rule, unless cases of strychnine-poisoning are treated early, they prove fatal, more especially when the amount taken has been large.

MEDICINAL USES.—As a *stomachic bitter and gastric tonic*, nux vomica is prescribed in cases of dyspepsia. The tincture is usually employed, and is combined with sodium bicarbonate and a simple bitter, such as gentian or calumba (see p. 425).

As a *general tonic*, nux vomica is prescribed in cases of general debility in all classes of patients, and may be combined with other tonics, such as iron and quinine. It increases appetite, assists digestion, imparts tone to the gastric walls, and regulates intestinal peristalsis. In canine practice, strychnine in combination with phosphate of iron and quinine, in the form of Easton's syrup, is prescribed with good results as a general tonic (see p. 131).

As a *stimulant to the spinal cord and central nervous system*, strychnine is prescribed in cases of paralysis of the limbs, bladder, or intestines. It cannot be of any benefit when distinct anatomical lesions of the central nervous axis are

present, or when the paralysis depends on hæmorrhage interfering with the functions of the brain or spinal cord, or on destruction of nerve-cells. In cases of paralysis of the hind-limbs which are so frequently met with in canine practice, the hypodermic injection of strychnine sometimes gives favourable results (see p. 566). The drug is *contraindicated* in the early stages of such affections, when the paralysis depends on an inflammatory process, or where marked irritation is present.

In cases of colic in the horse depending on fæcal obstruction in the intestines, nux vomica combined with ammonium carbonate in full doses is recommended by Mr. H. Caulton Reeks, F.R.C.V.S. (see p. 459). A similar combination is useful in cases of impaction of the colon, with paralysis of the intestinal walls.

As a respiratory stimulant, the hypodermic injection of strychnine is indicated in cases of threatened respiratory failure during anæsthesia, and in cases of poisoning by narcotic agents. In respiratory affections it is occasionally of value (see p. 589). It was generally believed that the hypodermic injection of strychnine was of marked value in the treatment of surgical shock, but recent experiments tend to show that, although in lesser degrees of shock it temporarily raised the blood-pressure and caused a marked improvement, which was transient, in severe cases it proved not only useless, but harmful. This was proved by experimental evidence. 'In animals suffering from shock, the administration of strychnine caused a rise in the blood-pressure which was influenced by the degree of shock—that is, if the degree of shock was slight, there was a marked temporary rise in blood-pressure; but if it was severe, strychnine produced no effect. In all stages the animal passed into a deeper degree of shock as soon as the effects of the strychnine passed off' (Mr. Lockhart Mummery, F.R.C.S., *Lancet*, April 1, 1905).

In cattle practice, nux vomica and strychnine are largely employed. In affections of the stomach which are usually accompanied by a paralysed condition of the gastric walls,

full doses of *nux vomica* combined with ammonium carbonate give good results (see p. 440).

In cases of paralysis depending on defective nervous power, which is sometimes met with both before and after parturition in cows, the hypodermic use of strychnine is indicated after delivery has taken place.

In consequence of the susceptibility of the dog to the action of strychnine, discrimination is necessary in prescribing this agent, especially for the smaller breeds. In some cases it is very difficult to compute the suitable dose, and what might be considered a moderate amount may produce the characteristic toxic symptoms. The cumulative action of the drug should be remembered in the treatment of cases in which it is necessary to continue its administration for some time.

In the treatment of cases of paralysis, the doses of the drug should be carefully increased, until slight twitching of the muscles is induced. The liquor strychninæ is the best preparation to employ, as its composition is constant.

Caffeine.

Caffeina—Caffeine.

An alkaloid obtained from the prepared and dried leaves of *Camellia thea* (the tea-plant), and from the dried seed of *Coffea Arabica* (the coffee-plant).

DOSES.—Horses, grs. xv. to $\bar{\text{v}}$ i.; dogs, gr. i. to grs. iv.

Caffeinæ citras—Caffeine citrate.

A combination of caffeine and citric acid.

DOSES.—Horses, $\bar{\text{v}}$ ss. to $\bar{\text{v}}$ ii.; dogs, grs. ii. to grs. viii.

ACTIONS.—Caffeine exerts its actions on the central nervous system, the heart, kidneys, and muscles. Its primary action on the central nervous system is that of *stimulation*. It stimulates the vaso-motor centres and causes a rise in the blood-pressure, and also accelerates respiration by stimulation of the respiratory centre. In animals large doses act chiefly on the spinal cord, and in toxic amounts produce tetanic spasms resembling those occurring in strychnine-poisoning.

Smaller doses induce restlessness without any alteration in the reflex excitability.

Caffeine has a special action on muscles, medicinal doses increasing their strength, extensibility, and power for work. Very large doses render the muscles stiff and hard, and induce a condition resembling *rigor mortis* of the muscle fibres; but paralysis of the respiratory centre usually occurs before this phenomenon appears.

Small doses accelerate the heart's action, this effect being due to a direct action on the heart muscle, probably an increased irritability of the cardiac fibres. In some instances the action of the heart may be rendered slower by caffeine; this is probably due to stimulation of the inhibitory centre in the medulla, which overcomes the direct acceleration.

Toxic doses cause a weak and irregular action of the heart, death occurring in diastole.

Respiration is accelerated and strengthened by caffeine, the drug acting as a respiratory stimulant. On the kidneys caffeine exerts a diuretic action. It increases the secretion of urine by acting directly on the renal epithelium; the fluid part is chiefly increased, the solids being augmented to a lesser extent. During diuresis the renal vessels become dilated, but this is due to the increased activity of the renal cells, and not to a direct action on the vessels.

In some cases caffeine does not act as a diuretic, the explanation being that, in consequence of the drug inducing stimulation of the vaso-motor centre, it may cause sufficient contraction of the arterioles to lessen the amount of blood passing through the kidneys, the result being that the stimulation of the renal epithelium produces no effect on the amount of urine secreted. In the dog, full doses of caffeine may produce vomiting and symptoms of gastro intestinal irritation.

MEDICINAL USES.—Caffeine is seldom employed in veterinary practice. It is recommended by Continental veterinarians as a general stimulant in the treatment of milk-fever in cows when there are symptoms of threatening failure of the circulation or respiration; for this purpose it

is injected hypodermically. Strychnine, however, appears to fulfil these indications in a more reliable manner.

Caffeine is occasionally prescribed as a diuretic in cases of cardiac, hepatic, or renal dropsy, in canine practice. Theobromine, an alkaloid obtained from the seeds of *Theobroma cacao*, is said to be more effectual as a diuretic in such cases, and may be combined with digitalis in the treatment of dropsy of cardiac origin.

CHAPTER XV
THE VEGETABLE KINGDOM (*continued*)

Digitalis.

Digitalis folia—Digitalis leaves.

The dried leaves of *Digitalis purpurea*, the purple foxglove.

DOSES OF THE POWDERED LEAVES.—Horses, grs. xv. to ̄ss.; cattle, ̄ss. to ̄i.; sheep, grs. v. to grs. x.; dogs, gr. $\frac{1}{4}$ to grs. ii.

Infusum digitalis—Infusion of digitalis.

One fluid ounce represents 3 grains of digitalis leaves.

DOSES.—Horses and cattle, ̄ii. to ̄iv.; dogs, ̄ss. to ̄ii.

Tinctura digitalis—Tincture of digitalis.

PREPARED by percolating $2\frac{1}{2}$ parts of digitalis leaves with alcohol (60 per cent.) to yield 20 parts (1 in 8).

DOSES.—Horses, ̄ii. to ̄iv.; cattle, ̄iv.; sheep, ℥xx. to ℥xxx.; dogs, ℥ii. to ℥x.

Incompatibles of digitalis and its preparations: Ferrous sulphate, tincture of ferric chloride, preparations of cinchona, acetate of lead. Although incompatibles, salts of iron are often prescribed with digitalis. The mixture becomes of an inky colour, in consequence of the tannic acid which is present in the drug combining with the iron; this can be prevented by the addition of citric acid.

A fluid extract of digitalis, which is adjusted to a definite standard by physiological assay, is also prepared, and is much to be preferred to the ordinary preparations, which are frequently unreliable. One cubic centimetre of this fluid extract represents 1 gramme of drug of standard strength.

The tincture can be prepared from this by mixing $2\frac{1}{2}$ fluid ounces with $17\frac{1}{2}$ fluid ounces of alcohol.

DOSES OF THE FLUID EXTRACT.—Horses, ℥x. to ℥xxv.; dogs, ℥ss. to ℥lii.

Digitalin is one of the glucosides found in digitalis; it possesses the medicinal actions of digitalis. The safe dose for the horse is stated to be from gr. $\frac{1}{12}$ to gr. i., given by the mouth; but it is not used in veterinary practice, and the commercial preparations of it often vary considerably in strength, and are not reliable.

Digitalin verum is said to be pure digitalin of definite composition. It possesses all the medicinal activity of digitalis on the heart, and is said to be safe for subcutaneous injection.

DOSES (*for hypodermic injection*).—Horses, gr. $\frac{1}{6}$; dogs, gr. $\frac{1}{100}$.

Digitalis contains a number of active principles in addition to digitalin, which possess the characteristic action of the drug on the heart; these include the glucosides termed digitoxin, digitalein, and digitophyllin. It also contains a glucoside termed digitonin.

Digitonin possesses irritant actions like those of saponin (obtained from quillaia bark), and appears to be to a certain extent antagonistic to the other active principles, as it causes dilatation of the vessels instead of contraction. All the glucosides, when pure, are insoluble in water, but are taken up from the leaves by water, and hence all are present in the infusion of digitalis, which is regarded as a powerful preparation. The infusion is said to possess a greater diuretic effect than the tincture. Digitonin is insoluble in alcohol, so that the tincture of digitalis does not contain it. Digitoxin is the most powerful constituent in digitalis.

ACTIONS OF DIGITALIS.

Locally, digitalis exerts an irritant action on mucous surfaces. It has little effect on the skin, but if injected subcutaneously it causes inflammation, which may terminate in the formation of an abscess. According to some authorities, pure digitalin does not produce this latter effect. According

to the late Professor Williams ('Veterinary Medicine'), digitalis repeatedly applied to the loins in the form of a decoction or poultice of the leaves excites the secretion of urine. In full doses, especially if continued for some time, digitalis produces irritation of the stomach and nausea in all animals. The chief actions of the drug are exerted on the *central nervous system, the heart, the bloodvessels, and the kidneys.*

On the Central Nervous System.—The chief effect is stimulation of the nervous centres in the medulla; this is independent of its action on the heart. Medicinal doses cause stimulation of the cardiac inhibitory and vaso-constrictor centres, an action which, as we shall see presently, is of importance in connection with the effect of the drug on the heart. Large doses stimulate other centres in addition to the above; thus the respiratory centre is acted on, and rapid, deep inspiratory movements are induced; these, after toxic doses, are followed by convulsions in the later stages. In dogs, the vomiting centre is affected and vomition occurs.

Digitalis acts but slightly on the *brain*; the effect of therapeutic doses is to cause a greater flow of blood through the cerebral vessels than is the case under normal conditions.

On the Heart, the most important actions of digitalis are exerted.

Modern authorities recognise *three* stages in the action of digitalis on the heart; the occurrence of these depends on the dose of the drug administered.

The first stage has been termed the *therapeutic* stage, because the effects produced result from the administration of medicinal doses, and are those which prove of therapeutic value. These effects are: a more complete and prolonged contraction of the ventricles and a stronger apex beat: the pulse is rendered slower and stronger, and the artery feels more tense. The ventricles empty themselves more completely than under ordinary conditions, and there is increased pressure in them during systole. But at the same time digitalis stimulates the cardiac inhibitory centre in the medulla; this tends to prolong the pause in diastole, and induces a slowing of the rhythm of the heart.

The increased contraction of the ventricles depends on a direct action of the drug on the cardiac muscle. The exact action on the cardiac muscle is not definitely understood; it is believed that the tone of the muscle is increased and the contractions are rendered more complete and prolonged. The action of digitalis in the first stage is a complex one, as two opposing factors are concerned in it. On the one hand, we have the drug acting on the cardiac muscle, rendering contraction more complete and prolonged, while it limits its relaxation; on the other hand, we have stimulation of the inhibitory apparatus, which tends to lessen the number of beats and to cause a prolongation of the pause in diastole. In the normal heart digitalis increases the relaxation of the ventricles during diastole, but if the heart is weak and dilated, the drug lessens the relaxation during diastole. The inhibitory effect of digitalis is chiefly due to stimulation of the vagus centre in the medulla, but it also depends to a lesser extent on stimulation of the intracardiac inhibitory apparatus.

Larger doses of the drug may increase either the effect on the cardiac muscle or the inhibitory action, and the result produced will vary according to which of these actions predominates.

The second stage may be termed that of *excessive inhibition*. It is not induced by medicinal doses, and must be regarded as *toxic* in character. In this stage the pulse becomes slow and irregular, the cardiac diastole is lengthened, and the ventricles dilate more completely. It depends on the inhibitory action becoming excessive, and predominating over the direct action of the drug on the cardiac muscle. The systole becomes weaker, the rhythm slower, and the amount of blood sent out from the heart is reduced in amount. In some cases the second stage may be absent, and only the first and third stages are observed.

The third stage occurs after the administration of very large doses. The heart-beats are greatly accelerated, and gradually become irregular and weak, death occurring from cessation of the heart's action in diastole. This marked acceleration of the cardiac action was formerly believed to

be due to paralysis of the vagus, but modern authorities ascribe it to a special action of the drug in increasing the irritability of the cardiac muscle to such a degree that the inhibitory apparatus is overcome.

On the Bloodvessels.—Digitalis causes an increase in the blood-pressure. This depends to a certain extent on the increased amount of blood which is sent from the heart into the systemic circulation, but also on a direct action of the drug on the walls of the bloodvessels, which has the effect of constricting the latter. In addition to these, the vaso-motor centre is stimulated.

Digitoxin is said to act more powerfully on the vessels than the other active principles of digitalis. Digitalin is said to cause dilatation of the bloodvessels of the extremities, the explanation being that the contraction of the abdominal vessels causes reflex stimulation of the vaso-dilator centre.

In the second stage the amount of blood sent out from the heart is lessened, so that the pressure in the larger vessels is reduced.

At the commencement of the third stage the pressure in the vessels may be temporarily raised, but the irregularity of the heart soon causes a fall in blood-pressure.

On the Renal Secretion.—Under *normal* conditions the secretion of urine is only slightly increased by digitalis, as compared with the diuretic action of the drug in cases where the arterial pressure is low and the secretion of urine scanty.

The increase of urine is due to *changes in the renal circulation*, and does not depend on stimulation of the renal epithelium, and the fluid of the urine is more largely augmented than the solids.

The usually accepted theory with reference to the diuretic action of digitalis is that the increased pressure in the glomerulus accelerates the filtration through the capsule. Some authorities state that, in addition to this, the changes in the circulation—viz., an increased amount of blood in the arteries and a fall in the venous pressure—lead to an augmented flow of lymph into the bloodvessels. The blood

thus becomes diluted, and the kidneys are excited to increased activity.

Large doses of the drug seem to act as *irritants* to the renal epithelium, as they cause the appearance of blood and albumin in the urine. It must be remembered that digitalis, if administered in too full doses or too often repeated, may produce such constriction of the renal vessels that the flow of urine may be arrested. The presence of digitonin in the infusion of the drug is said to account for this preparation being more effective as a diuretic than the tincture.

Digitalis is *cumulative* in its action. This is an important point with reference to its therapeutic employment. It probably depends on irregularities in the absorption and excretion of the drug. Both absorption and excretion are slow, and if the agent accumulates in the blood, toxic symptoms may ensue, evidenced by a slow and irregular pulse, muscular weakness, and nausea.

TOXIC ACTIONS.—The toxic dose of powdered digitalis for the horse is stated to be from 6 to 8 drachms and of digitalin $1\frac{1}{2}$ grains. The symptoms observed are nausea, purging, the fæces being sometimes tinged with blood. The pulse is at first slow and full, but soon becomes quick and irregular; the action of the heart is accompanied by a vibratory thrill and a distinct bellows murmur; colicky pains, difficult respiration, tympanites, salivation, and frequent urination are also present.

In the dog the toxic dose of powdered digitalis is said to be from 1 to 2 drachms and of digitalin $\frac{1}{4}$ grain. The symptoms observed are vomiting, laboured respiration, a weak, irregular pulse, frequent attempts at urination, abdominal pain, and muscular debility.

Cases of poisoning by digitalis are seldom met with in veterinary practice, but instances in which the toxic symptoms of the second stage have been induced by too full doses, or by continuing the drug for too long a period, occur occasionally.

The suitable **ANTIDOTES** are stimulants such as alcohol or aromatic spirit of ammonia. Tannic or gallic acid is also recommended.

In the dog treatment should be commenced by the administration of an emetic.

MEDICINAL USES.—The chief use of digitalis is in connection with the treatment of certain affections of the heart and of the sequelæ resulting from such diseases. It must be distinctly understood, however, that the drug is not indicated in all cases of cardiac affections, and that its employment requires discrimination and judgment.

The conditions in which it is likely to be of service are those characterised by the blood tending to accumulate in the veins, while the arteries are less completely filled than in a normal state.

The uses of digitalis in equine practice are lessened by the fact that horses suffering from marked organic affections of the heart are useless for work, and are unsafe, in spite of any treatment.

In canine practice, however, this element need not be considered.

In functional disorders of the heart in the horse, the judicious employment of digitalis sometimes proves of value.

In cases of dilatation of the heart, with a weak and insufficient systole, digitalis, by its action on the cardiac muscle, overcomes the condition, *provided* no degeneration of the cardiac walls is present. It increases the ventricular systole, raises the blood-pressure in the arteries, and improves the nutrition of the heart itself.

In certain valvular diseases, such as mitral incompetency, digitalis, by causing stronger contractions of the ventricles, overcomes the tendency to congestion of the lungs, and also, owing to the increase in systole, it lessens the mitral orifice, and thus diminishes the proportion of blood which regurgitates into the left auricle. The congestion of the systemic veins is lessened, and the kidneys are assisted to excrete the abnormal amount of fluid which has accumulated in the body.

In cases of aortic incompetency and aortic stenosis digitalis is also prescribed with beneficial results.

In cases characterised by an irregular irritable condition of the heart, such as may occur during convalescence from

influenza and allied affections, the judicious administration of digitalis in combination with iron proves of value in some instances.

Digitalis is *contra-indicated* in valvular affections when compensatory hypertrophy is present. It is when such hypertrophy is absent or tends to fail that the drug is likely to produce beneficial results.

It is also *contra-indicated* in cases of cardiac dilatation when extensive fatty degeneration of the organ is present, as the cardiac muscle is unable to respond to the stimulation, and, as the blood-pressure in the arteries becomes raised, the heart may be unable to overcome the increased resistance, and sudden death may result.

This drug is also *contra-indicated* in cases of extensive degeneration of the arterial walls, such as occurs in some forms of renal disease, as the increased pressure which is produced may lead to rupture of the cerebral vessels.

It must be remembered that digitalis, if administered in full and prolonged doses, may produce symptoms which might be mistaken for those of disease, and if the drug be continued with a view to combat these symptoms serious results will ensue. These symptoms consist of a quick, feeble, intermittent pulse, and suppression of urine.

As a *diuretic*, digitalis is seldom employed alone, except when the interference with the urinary secretion is secondary to disturbances of the circulation. In ascites due to cardiac disease digitalis may be combined with other diuretics, such as the acetate of potassium.

In canine practice cases of ascites of obscure origin are met with, and a combination of digitalis with potassium iodide occasionally proves useful.

In the treatment of suppression of urine or of uræmia resulting from nephritis in the horse, the late Professor Williams advised the application of digitalis to the region of the loins, either in the form of a decoction of the leaves repeatedly applied or as a poultice.

Digitalis forms a constituent of powders for the relief of cough in the horse, but its action in this respect is doubtful.

Many other uses have been suggested for this drug, but the results obtained do not justify its employment.

In prescribing digitalis, the *cumulative* action must be remembered. The drug must not be continued for too long a period, and the doses should be carefully graduated. The nausea, loss of appetite, and gastric irritability induced by digitalis, especially in some patients, must also be kept in mind, and on the first appearance of these symptoms the doses should be reduced or the drug discontinued. Small doses, administered twice or three times daily, give the best results, the effects on the pulse and on the system generally being carefully watched.

Strophanthus.

Strophanthi semina—Strophanthus seeds.

The dried ripe seeds of *Strophanthus Kombé*. The active principle is a glucoside termed strophanthin.

Tinctura strophanthi—Tincture of strophanthus.

One part of strophanthus seed in 40 parts of alcohol.

DOSES.—Similar to those of digitalis.

ACTIONS AND USES.—Strophanthus resembles digitalis to a certain extent in its actions. It is more soluble, and hence acts more rapidly. It acts more energetically on the heart itself and less on the bloodvessels, and does not increase arterial tension; it is said not to be cumulative in its effects, and is not so liable to induce gastric irritation.

Strophanthus may be prescribed in cases where it is desirable to act on the heart, and not on the vessels. It may also be employed in cases where digitalis is found to disagree with the patient.

Squill.

Scilla—Squill.

The dried bulb of *Urginea scilla*.

Syrupus scillæ—Syrup of squill.

Vinegar of squill, 20; refined sugar, 38 (about 1 part of squill in 18 parts of syrup).

DOSES.—Horses, ̄ss. to ̄i. ; dogs, ̄ss. to ̄i.

Tinctura scillæ—Tincture of squill.

One part of squill in 5 parts of alcohol.

DOSES.—Similar to those of tincture of digitalis.

ACTIONS AND USES.—Squill is a stimulating expectorant, a cardiac tonic, and a diuretic. It resembles digitalis in its action on the heart, circulation, and kidneys, but is more irritating and more liable to produce gastro-intestinal irritation.

Large doses in the dog cause vomiting, purging, and urinary irritation.

The chief use of squill is in the treatment of chronic bronchitis in the dog. It increases the bronchial secretions and accelerates the removal of the inflammatory products. This action is believed to be a remote local one—*i.e.*, the structures of the bronchial wall are stimulated during the excretion of the drug.

It is *contra-indicated* in cases of acute bronchitis.

As a *diuretic*, squill is occasionally prescribed in cases where large accumulations of fluid exist in the abdominal cavity. It may be combined with small doses of digitalis and calomel.

According to some authorities, squill exerts a direct stimulating influence on the renal epithelium.

Convallaria.

Convallaria—The flowers as well as the entire plant of *Convallaria majalis*, the lily of the valley.

Tinctura convallariæ—Tincture of convallaria.

One part of convallaria in 8 parts of proof spirit.

DOSES.—Similar to those of tincture of digitalis.

ACTIONS AND USES.—Convallaria resembles digitalis in its actions. It is said not to possess the nauseating effects of the latter and not to be cumulative in its actions. It is occasionally prescribed in veterinary practice as a cardiac tonic and diuretic.

Another drug which resembles digitalis in its actions is **Broom**, the fresh dried tops of *Cytisus scoparius*. It is a powerful diuretic, but is seldom employed in veterinary practice. Broom contains the alkaloid sparteine, which resembles conine in some of its actions.

CHAPTER XVI

THE VEGETABLE KINGDOM (*continued*)

SIMPLE BITTERS AND AROMATIC VOLATILE OILS.

SIMPLE bitters are represented by agents such as calumba and gentian. They possess a bitter taste, increase secretion of saliva in a reflex manner, stimulate the gastric secretion, and improve digestion. It is doubtful whether the action on the gastric secretory cells is a direct one. Many authorities believe that the increased gastric secretion depends on reflex causes, mainly through the bitter taste of the agents, and also by the influence that the increased flow of saliva has on the flow of gastric juice. The results of the administration of simple bitters are an increased appetite and improved digestion. They should not be continued for too long a period, and their employment in irritable conditions of the stomach requires discrimination.

The most important of this series are calumba, gentian, and quassia. Others, such as chiretta, pareira, serpentary, and cusparia, are not employed in veterinary practice.

Calumba.

Calumbæ radix—Calumba root.

The dried root of *Jatecorhiza Calumba*.

It contains an active principle termed calumbin and an alkaloid, berberine. The preparation usually employed is the tincture.

Tinctura calumbæ—Tincture of calumba.

One part of calumba root in 10 parts of alcohol.

DOSES.—Horses and cattle, ʒi. to ʒii.; sheep and pigs, ʒi. to ʒii.; dogs, ʒss. to ʒi.

ACTIONS AND USES.—Calumba is a bitter stomachic. It promotes secretion of gastric juice, assists digestion, and increases appetite. It is prescribed in cases of atonic dyspepsia in all animals, and may be combined with a nerve tonic such as nux vomica and an alkali such as sodium bicarbonate. As calumba does not contain any tannic acid, it may be combined with preparations of iron, without causing a change of colour in the mixture or throwing down a precipitate.

Gentian.

Gentianæ radix—Gentian root.

The dried rhizome and roots of *Gentiana lutea*—the yellow gentian. It contains an active principle—gentio-picrin.

DOSES OF POWDERED GENTIAN ROOT.—Horses, ʒss. to ʒi.; cattle, ʒi. to ʒii.; sheep and pigs, ʒi. to ʒii.; dogs, grs. v. to grs. xx.

Tinctura gentianæ composita—Compound tincture of gentian.

Gentian root, 2; dried bitter orange-peel, $\frac{3}{4}$; cardamom seeds, $\frac{1}{4}$; macerated with 20 of alcohol; (1 in 10).

DOSES.—Horses and cattle, ʒi. to ʒii.; dogs, ʒss. to ʒi.

A compound infusion of gentian and an extract of gentian are also prepared, but are seldom employed in veterinary practice.

INCOMPATIBLES.—Ferrous sulphate; but the combination is often employed.

ACTIONS AND USES.—Gentian is a bitter tonic, possessing but slight astringent actions. It is more extensively employed in veterinary practice than any of the other vegetable bitters. As it contains a small proportion of tannic acid, it is incompatible with preparations of iron; but, nevertheless, the combination is frequently prescribed, and proves useful.

Gentian is a valuable agent in the treatment of certain gastric affections.

Powdered gentian, combined with the sulphate of iron, forms a tonic powder which is frequently prescribed as a general tonic for horses and cattle. The addition of

powdered gentian to aloes is said to increase the purgative action of the latter drug.

Quassia.

Quassia lignum—Quassia wood.

The wood of the trunk and branches of *Picræna excelsa*. It contains an active principle termed 'quassine.'

The preparations of the drug used are an infusion (1 in 100) and a tincture (1 in 10). Of the infusion, the dose for horses is from \bar{z} ii. to \bar{z} iv., and for dogs, \bar{s} ss. to \bar{s} i. Of the tincture, the doses are similar to those of tincture of gentian.

ACTIONS AND USES.—Quassia resembles in its actions gentian and calumba. As it does not contain any tannic acid, it is compatible with iron salts. As a bitter tonic, it has similar uses to gentian and calumba. In the form of infusion it is employed as an enema to destroy ascarides in the rectum.

The infusion combined with glycerine, if applied to the skin of animals at pasture, prevents irritation from flies, by acting as a narcotic poison to the latter.

Hydrastis.

Hydrastis rhizoma—The dried rhizome and roots of *Hydrastis canadensis*, the golden seal.

It contains the alkaloids hydrastine and berberine.

The chief preparations of the drug are a tincture and a liquid extract.

ACTIONS AND USES.—Hydrastis is a bitter tonic, nervine stimulant, hæmostatic, and astringent. To a certain extent it resembles nux vomica in its actions. Applied to mucous surfaces, it acts as a hæmostatic and mild astringent. It is seldom used in veterinary practice. It has been recommended as an injection in the treatment of nasal gleet in the horse, 1 ounce of the liquid extract being diluted with a quart of water. Its hæmostatic action is slight, and depends on the constriction of the bloodvessels which it

produces. Hydrastine is a toxic agent which at first stimulates the nerve-centres and spinal cord, and eventually paralyses these structures.

AROMATIC VOLATILE OILS.

A large number of agents are included in this group, but comparatively few of these are used in veterinary practice. They all possess antiseptic properties, and also exert a carminative action on the stomach and intestines. Some exert antispasmodic effects, while the majority, during their excretion, stimulate and to a certain extent disinfect, the kidneys and respiratory passages.

Externally, they act as antiseptics and stimulants to the skin. Some exert a local anæsthetic effect; others are counter-irritants.

Oil of Cloves.

Oleum caryophylli—Oil of cloves.

A volatile oil obtained from the dried flower-buds of *Eugenia caryophyllata*.

Oil of cloves is sometimes employed in combination with cocaine as a local anæsthetic, being painted on the parts prior to the operation of 'firing.' It has been recommended as an application in cases of open joint; but its value is doubtful.

Infusum caryophylli—Infusion of cloves—is prescribed in combination with dilute sulphuric acid and decoction of logwood in the treatment of diarrhœa in the dog (see p. 485).

Dose of the infusion for the dog ʒii. to ʒi.

Oil of Peppermint.

Oleum menthæ piperitæ—Oil of peppermint—an oily liquid distilled from fresh flowering peppermint, *Mentha piperita*. Its principal constituent is menthol.

DOSES.—Horses, ℥xx. to ʒi.; dogs, ℥ss. to ℥iii.

ACTIONS AND USES.—Oil of peppermint is an antiseptic, a carminative, and an antispasmodic.

Externally, it causes contraction of arterioles, and it acts as a local anæsthetic by paralysing the terminations of sensory nerves in the part to which it is applied.

Oil of peppermint is employed by some practitioners in the treatment of spasmodic colic in the horse. It relieves pain by depressing the terminations of the intestinal sensory nerves, and also relaxes intestinal spasm. It is sometimes combined with purgative agents, in order to lessen the tendency to griping.

Aqua menthæ piperitæ, or peppermint water, consists of 1 part of the oil in about 1,000 parts of water. It is employed in canine practice to disguise the taste of nauseous drugs.

Menthol is a local anæsthetic, but is not used in veterinary practice.

Oil of peppermint is contained in chlorodyne (see p. 246).

Oil of lavender and **oil of rosemary** resemble the other aromatic volatile oils in their action, and are chiefly employed as components of stimulating liniments.

The former is contained in compound camphor liniment (see p. 327).

Oil of origanum is obtained from *Origanum vulgare* (wild marjoram). It acts as an irritant when rubbed into the skin, and is sometimes added to blisters and liniments.

Oil of Juniper.

Oleum juniperi—Oil of juniper, an oil distilled from the fruit of *Juniperus communis*.

ACTIONS AND USES.—It is a stimulant, a carminative, an antispasmodic, and a stimulating diuretic. It is seldom employed in veterinary practice.

As a diuretic, the dose for horses and cattle is from ʒi. to ʒii.

Juniper berries are employed for imparting the characteristic flavour to gin.

Oleum cadinum—Oil of cade, also known as juniper tar oil, *huile de cade*.

This is a product of the dry distillation of the branches and wood of *Juniperus oxycedrus* and other species.

ACTIONS AND USES.—Oil of cade is occasionally used as a stimulating application to the skin in cases of psoriasis and chronic eczema. For such purposes an ointment composed of oil of cade, 1 part, with vaseline, 4 parts, may be employed.

Anise.

Anisi fructus—Anise fruit.

The dried fruit of *Pimpinella anisum*.

DOSES.—Horses, ̄ss. to ̄i. ; cattle, ̄i. to ̄ii.

Oleum anisi—Oil of anise.

Obtained by distillation from anise fruit.

DOSES.—Horses, ʒxv. to ʒxl. ; dogs, ʒ ss. to ʒ iii.

ACTIONS AND USES.—Oil of anise has similar actions to the other aromatic volatile oils. It has in addition to these a slight expectorant action, probably exerted during the excretion of the drug by the bronchial mucous membrane.

Oil of anise is seldom prescribed for the horse, but in canine practice it is chiefly used as an addition to cough mixtures or as a flavouring agent. It is contained in compound tincture of camphor.

The powdered anise fruit forms a frequent component of cough powders for the horse, and is also used as a flavouring agent in cattle drenches.

Other agents resembling anise in their actions, and containing aromatic volatile oils, are carraway, coriander, fenugreek, fennel, dill, and cardamoms. They are chiefly used as flavouring agents to powders, drenches, etc., and enter largely into the composition of popular condition powders and condiments.

Ginger.

Zingiber—Ginger.

The scraped and dried rhizome of *Zingiber officinale*. It contains an oleo-resin known as gingerin, and an aromatic volatile oil.

DOSES OF POWDERED GINGER.—Horses, ̄ss. to ̄i. ; cattle,

ʒi. to ʒii. ; sheep, ʒi. to ʒii. ; pigs, ʒss. to ʒi. ; dogs, grs. x. to grs. xx.

Tinctura zingiberis—Tincture of ginger.

One part of ginger in powder, percolated in alcohol to yield 10 parts (1 in 10).

DOSES.—Horses, ʒi. to ʒii. ; dogs, ʒxx. to ʒss.

A strong tincture composed of 1 part of ginger in 2 parts of alcohol is also prepared, and is known as essence of ginger.

ACTIONS AND USES.—Ginger is an aromatic stimulant and a carminative. It is chiefly employed as a corrective to purgative agents, in order to prevent the occurrence of griping. Thus it is combined with aloes for the horse and with magnesium sulphate for cattle.

The tincture of ginger is sometimes employed in the treatment of simple spasmodic colic.

Gingerin is a convenient form of the drug to combine with purgative pills for the dog.

Oil of Eucalyptus.

Oleum eucalypti—Oil of eucalyptus.

The oil distilled from the fresh leaves of *Eucalyptus globulus*, the blue gum-tree of Australia, and other species of eucalyptus.

DOSES.—Horses, ʒi. to ʒiv. ; dogs, ʒss. to ʒiii.

It may be administered in the form of an emulsion or mixed with olive-oil.

ACTIONS AND USES.—Oil of eucalyptus is a powerful antiseptic and deodoriser.

Internally, it also exerts antiseptic actions, and is, in addition, an antipyretic.

It may be employed in the treatment of all cases of a septic nature, and has occasionally given good results in canine distemper.

In addition to its internal administration, frequent inhalations of the drug are indicated in respiratory affections of a septic nature.

When used as an inhalation, it is of advantage to combine

a little light carbonate of magnesia with the oil of eucalyptus before adding the latter to the hot water. This causes the oil to become equally diffused in the water, and the vapour is given off much more freely.

In bronchitis, broncho-pneumonia, laryngitis, etc., eucalyptus-oil is largely employed in the form of inhalation (see p. 576). It is also useful as a gastric disinfectant, as it prevents excessive fermentation of the ingesta.

Externally, it forms a useful antiseptic application in the form of ointment, the strength being from 1 in 5 to 1 in 10 of vaseline or lanolin.

Wool and gauze medicated with oil of eucalyptus are sometimes used as surgical dressings.

Oil of Turpentine.

Oleum terebinthinæ—Oil of turpentine.

A limpid liquid distilled from the oleo-resin (turpentine), obtained from *Pinus Australis*, *Pinus tæda*, *Pinus sylvestris*, and other species of pinus.

DOSES.—Horses, $\bar{\text{z}}$ i. to $\bar{\text{z}}$ ii.; cattle, $\bar{\text{z}}$ ii. to $\bar{\text{z}}$ iv.; sheep and pigs, $\bar{\text{z}}$ i. to $\bar{\text{z}}$ iv.; dogs, \mathbb{M} ii. to \mathbb{M} xx.; six-months-old calves, $\bar{\text{z}}$ ss.; six-months-old lambs, $\bar{\text{z}}$ i.

In order to prevent the irritating effect of the drug on the mouth and alimentary canal, it should be well shaken up with oil, milk, or mucilage before administration.

A convenient emulsion of the drug for canine practice is prepared by rubbing up 30 grains of powder of gum acacia with 1 drachm of oil of turpentine and 1 drachm of distilled water, and then adding gradually 1 ounce of distilled water.

Oleum terebinthinæ gallicum—French oil of turpentine.

This is prepared from *Pinus maritima*. It is believed to contain ozone, and is employed in cases of poisoning by phosphorus (see p. 150).

Linimentum terebinthinæ—Liniment of turpentine.

PREPARED by dissolving 1 part of camphor in 13 parts of oil of turpentine, and adding them gradually to a mixture of $1\frac{1}{2}$ parts of soft-soap in 2 parts of distilled water, with con-

stant trituration, until a cream is produced, and adding distilled water to yield 20 parts (about 1 in $1\frac{1}{2}$).

Linimentum terebinthinæ aceticum—Liniment of turpentine and acetic acid.

PREPARED by mixing oil of turpentine, 4; glacial acetic acid (by weight), 1; liniment of camphor, 4 (about 1 in 2).

ACTIONS OF OIL OF TURPENTINE.

Internally, it exerts stimulant, antiseptic, hæmostatic, diuretic, and anthelmintic actions.

Externally, it is a rubefacient; if applied in concentrated form and if evaporation be prevented, it acts as a counter-irritant, the vesication produced being painful, and heals slowly.

On the gastro-intestinal canal turpentine acts in a similar manner to other aromatic volatile oils, but is more powerful.

In the stomach it acts as a disinfectant and a reflex stimulant.

In the intestines it acts reflexly as a stimulant to the muscular coat, producing contraction of the latter and the expulsion of gas in cases of tympanites.

Its anthelmintic action is chiefly confined to the destruction of round-worms, as it has far less effect on tape-worms. Turpentine is rapidly absorbed, diffused, and excreted.

In medicinal doses it increases the secretion of urine, to which it gives an odour resembling that of violets.

The hæmostatic action of turpentine is not definitely understood; it probably depends on the contraction of the arterioles induced by the drug.

Toxic doses cause primary stimulation and subsequent paralysis of the nerve-centres in the medulla, the actions resembling those of alcohol. Irritation of the kidneys is produced, and in some instances suppression of urine, strangury, or hæmaturia. The drug may also induce purgation. Turpentine is excreted by the kidneys, lungs, skin, and intestines.

ANTIDOTES.—Sulphate of magnesia and demulcents. In the dog an emetic should first be given.

MEDICINAL USES.—In acute gastric tympany and in flatulent colic the oil of turpentine is a most valuable agent. It causes expulsion of the gases, arrests fermentation, and restores the muscular coat of the organs involved to their normal condition. It is usually combined with a preparation of ammonia, and administered in a full dose of raw linseed-oil. If necessary, it may be repeated.

In tympanites of the rumen in cattle, commonly known as hoven, oil of turpentine combined with ammonia, and administered in a full dose of raw linseed-oil, gives good results.

In dysentery, whether occurring in horses or cattle, small doses of oil of turpentine, combined with other antiseptics and with astringents, are prescribed, and prove effectual (see p. 472).

In purpura hæmorrhagica this drug gives good results, probably acting by overcoming the tendency to extravasation that is present in this affection. It is usually combined with the tincture of ferri perchloride, 1 ounce of each being administered in wheat gruel, raw eggs and milk, three times daily.

As a *hæmostatic*, in cases of internal hæmorrhage, oil of turpentine is recommended by some authorities, but other agents are more reliable for this purpose.

As an *anthelmintic*, oil of turpentine is frequently prescribed, and is effectual in the case of round-worms in the horse. For this purpose it is administered in raw linseed-oil. For tape-worms it is usually combined with male-fern.

In canine practice the drug must be very carefully administered, as it is apt to produce irritation of the stomach and kidneys. In properly regulated doses it is employed in combination with other anthelmintic agents in the eradication of intestinal parasites in the dog (see formula, p. 353).

In the treatment of parasitic bronchitis in calves the oil of turpentine is administered by intratracheal injection, and proves a most effectual remedy in this affection.

Two drachms of oil of turpentine, 10 minims of pure carbolic acid or lysol, 1 drachm of olive-oil, 20 grains of

potassium carbonate, and 1 drachm of water, are mixed together to form an emulsion. This amount is injected into the trachea once a day for three days.

As an antidote to phosphorus-poisoning, the French oil of turpentine is highly recommended by many authorities, the explanation of its action being that it renders the poison innocuous in the stomach by oxidising it. Recently, however, some authorities have failed to detect ozone in turpentine, and deny the efficacy of this drug in phosphorus-poisoning.

Oil of turpentine has recently been found to be an antidote to carbolic acid poisoning in the horse.

CONTRA-INDICATIONS.—Turpentine is contra-indicated in congestion of the kidneys, also in nephritis, gastritis, and enteritis.

Externally, oil of turpentine is employed as a constituent of stimulating liniments, embrocations, etc. It should not be used in too concentrated a form, as it is an undesirable counter-irritant, causing great irritation and having a tendency to injure the hair-roots.

The liniment of turpentine is employed as a rubefacient application in rheumatic affections of joints and muscles, also to the skin in the region of the throat in cases of laryngitis and pharyngitis.

For the destruction of maggots in sheep, the following proves useful as a local application: 3 ounces of oil of turpentine, 1 ounce each of common salt, olive-oil, and mucilage, and $\frac{1}{2}$ drachm of corrosive sublimate, mixed in a quart of water.

Terebenum—Terebene—is produced by the action of sulphuric acid on oil of turpentine and the distillation of same.

DOSES.—Similar to those of oil of turpentine.

ACTIONS AND USES.—Terebene resembles oil of turpentine in its actions, but is more diffusible and less irritating in its effects on the kidneys. It is a useful agent in the treatment of gastric tympany and flatulent colic in the horse. It is largely employed as an inhalation in cases of bronchitis, laryngitis, etc., and also proves useful in a similar manner

in the treatment of irritable cough depending on bronchial irritation in the dog. The addition of light carbonate of magnesia renders the drug diffusible in the hot water, so that its vapour is given off more readily.

Terpinum hydratum—Terpene hydrate; terpene—is a crystalline derivative of oil of turpentine, prepared by the action of nitric acid on the latter in the presence of alcohol and water. It is occasionally prescribed in the treatment of bronchitis, as it possesses expectorant actions. Combined with heroin, it has been found useful in the treatment of irritable coughs.

DOSES.—Horses, ʒss. to ʒii.; dogs, grs. ii. to grs. vi., administered in glycerine or syrup.

Terpinol is obtained by the action of dilute sulphuric acid on terpene, and has similar actions to the latter. Terpinol disinfecting fluid is said to be non-poisonous, and also effective as a germicide and general disinfectant.

Sanitas is prepared by the oxidation of oil of turpentine; it contains hydrogen peroxide, a soluble camphor, some camphoric acid, and thymol. Sanitas fluid forms a volatile oxidising non-poisonous disinfectant and deodorant; it is employed to disinfect and deodorise stables and kennels. Sanitas powder and sanitas sawdust are used for a similar purpose.

Oleum pini sylvestris is obtained from various species of pine. It resembles oil of turpentine, and is sometimes employed as a mild counter-irritant in canine practice.

Resina—Resin. The residue from the crude oleo-resin remaining after the distillation of oil of turpentine. Internally, in doses of $\frac{1}{2}$ ounce to 1 ounce it is a diuretic and mild astringent, and forms a popular constituent of diuretic balls and powders. Externally, it is stimulant, antiseptic, and astringent, and, when melted and applied to a bleeding surface, it acts as a styptic.

Unguentum Resinæ—Resin ointment—consists of resin in powder, 8; yellow beeswax, 8; olive-oil (by weight), 8; and lard, 6 (1 in $3\frac{3}{4}$). It is a mild stimulating agent, which at one time was a favourite application for wounds, etc., but

dressings of this nature are not in accordance with modern surgical principles. Resin ointment is sometimes employed in combination with other ointments to increase their bulk and consistency.

Thymol.

Thymol, a crystalline substance, occurs in common thyme and several other plants. It resembles carbolic acid in its actions, but causes less stimulation of the central nervous system, and is less irritant when applied to wounds.

Toxic doses produce fatty degeneration of the liver, congestion of the lungs, and irritation of the intestines and kidneys. It possesses considerable antiseptic and disinfectant properties, but is seldom employed for these purposes. Its chief use in veterinary practice is in the treatment of strongylosis in foals. In such cases it is prescribed in a dose of from 10 to 15 grains, dissolved in glycerine and alcohol, and administered in milk or mucilage. This is given daily for four or five consecutive days, and followed up with a laxative. Thymol is sometimes prescribed as an anthelmintic for the dog, the dose being from gr. ss. to grs. ii.

Venice Turpentine.

Terebinthinæ Veneta—Venice turpentine (contains 15 per cent. of oil of turpentine)—is obtained from the *Larix Europæa*, the common larch.

A commercial variety is prepared by dissolving 3 parts of common resin in 1 part of oil of turpentine. Venice turpentine is occasionally employed as a diuretic.

It has also been prescribed in the pulmonary complications of that affection known as 'white scour' in calves, but with doubtful results.

Wood-tar.

Pix liquida—Wood-tar—is obtained from the wood of *Pinus sylvestris* and other species of pines by destructive distillation.

Oil of Tar.

Oleum picis liquidæ—Oil of tar.

A volatile oil distilled from tar.

Oleum picis rectificatum—Light oil of tar; also known as rectified spirit of tar.

ACTIONS AND USES.—Tar possesses antiseptic, stimulant, expectorant, and parasiticide actions. In the form of tar-water, obtained by stirring a pint of tar in $\frac{1}{2}$ gallon of water for fifteen minutes and decanting, it is found of value as a palliative measure in the treatment of chronic cough and broken wind in horses. Or tar can be stirred into a barrel of water, and the latter employed as drinking-water for the animal.

Externally, tar is employed in the treatment of dry, scaly skin diseases, 1 part of the agent being mixed with 4 parts of zinc oxide ointment. As a hoof ointment and stopping for horses' feet, in cases of dryness and brittleness of the wall and deficient growth of horn, tar combined with other agents is found useful, the following being often employed for this purpose: 4 ounces each of tar, beeswax, and honey, 3 ounces of glycerine, and $1\frac{1}{2}$ pounds of veterinary lanolin. The latter and the beeswax are first melted together, and the other ingredients then stirred in.

In the treatment of foot-rot in sheep, tar ointment is found to give good results.

The oil of tar, combined with sulphur, linseed-oil, and an alkali such as potassium carbonate, is largely employed as a dressing for mange in the horse.

The rectified spirit of tar, combined with an equal amount of raw linseed-oil, forms a useful absorbent liniment in cases of bursal distensions, capped hocks, etc., being applied with a brush once daily.

Spirit of tar combined with iodine is employed in the treatment of ringworm (see p. 158).

Pitch.

Pix nigra—Black pitch.

The residue remaining after the distillation of tar. Two

varieties are recognised—viz., *Archangel* and *Swedish*. Another form of pitch is obtained from gas-tar.

Pitch is employed in the form of plasters and charges for surgical purposes.

The late Professor Williams advised its internal administration in the treatment of dry, scaly affections of the skin, such as pityriasis.

Burgundy pitch is the prepared resinous exudate from the stem of *Picea excelsa*, the spruce fir-tree.

It is employed as a stimulant and adhesive plaster in the treatment of swollen joints, etc., and for this purpose is spread on leather or on bandages.

An imitation of the true Burgundy pitch is made by melting resin and palm-oil, and stirring in some water.

The official emplastrum picis consists of—Burgundy pitch, 26; frankincense, 13; resin, $4\frac{1}{2}$; yellow beeswax, $4\frac{1}{2}$; olive-oil, 2; and distilled water, 2. These are melted together and evaporated to the consistence of a plaster.

Tallianine.

Tallianine is obtained by the action of ozone on a terpene-bearing volatile oil. If administered by intravenous injection, it is said to cause abundant leucocytosis, and to exert an antiseptic action on the blood. In cases of pneumonia, purpura, etc., it has been found useful by American and Continental practitioners, the dose for the horse being from 10 to 20 cubic centimetres given twice daily.

Camphor.

Camphora—Camphor—occurs in the form of a crystalline transparent solid or a white crystalline powder, and is obtained from the wood of *Cinnamomum camphora*.

DOSES.—Horses, ʒss. to ʒii.; cattle, ʒii. to ʒiv.; sheep and pigs, grs. xx. to grs. xl.; dogs, grs. v. to grs. x.

Spiritus camphoræ Spirit of camphor; tincture of camphor.

Camphor, 1; alcohol, q.s. to make 10 (1 in 10).

DOSES.—Horses, ʒss. to ʒi.; cattle, ʒii.; dogs, ʒv. to ʒxx.

Tinctura camphoræ composita—Compound tincture of camphor ; Paregoric.

Tincture of opium, 585 minims ; benzoic acid, 40 grains ; camphor, 30 grains ; oil of anise, $\frac{1}{2}$ fluid drachm ; alcohol to make 20. Sixty minims is equivalent to $\frac{1}{4}$ grain of opium.

DOSES.—Horses, $\bar{3}$ i. to $\bar{3}$ ii. ; dogs, $\bar{5}$ ss. to $\bar{5}$ i.

Aqua camphoræ—Camphor water.

Camphor (in sublimed powder), 1 part ; alcohol, q.s. to make 3 parts ; distilled water to 1,000 parts.

DOSE for dogs, $\bar{5}$ ss. to $\bar{5}$ i.

Linimentum camphoræ—Liniment of camphor ; camphorated oil.

Camphor, 1 ; olive-oil, 4 (1 in 5).

Linimentum camphoræ ammoniatum—Ammoniated liniment of camphor ; compound liniment of camphor.

Camphor, 5 ; strong solution of ammonia, 10 ; oil of lavender, $\frac{1}{4}$; alcohol, q.s. to make 40 (1 in 8).

ACTIONS.—Camphor possesses sedative, antispasmodic, carminative, expectorant, diaphoretic, and feebly antiseptic actions.

Externally, its actions resemble those of other volatile oils. If applied with friction to the skin it acts as a rubefacient, but after primary stimulation it produces sedative effects on the peripheral nerve-endings.

Internally, camphor is rapidly absorbed, it acts as a carminative by exerting reflex stimulating effects on the intestinal canal, it also acts as an antispasmodic, and lessens the irritability of the intestinal mucous membrane.

On the nervous system, it stimulates the higher nervous centres.

Authorities are not agreed as to its action on the spinal cord. It is excreted by the respiratory organs, producing expectorant effects, and also by the skin and kidneys. Its diaphoretic action is not observed in animals.

Toxic doses cause stimulation of the higher nervous centres, followed by paralysis.

The symptoms induced are excitement, restlessness, and

convulsions. In some cases, instead of excitement, a condition of stupor occurs, and death results from respiratory failure.

The action of the heart becomes slow, probably due to a direct effect of the drug on the cardiac muscle; the blood-pressure may either be increased or lessened, and respiration is rendered slower and deeper.

MEDICINAL USES.—As a carminative, camphor is prescribed in cases of diarrhœa and intestinal irritation, being usually combined with astringents and antacids for this purpose. The compound tincture is preferred, in consequence of the opium which it contains.

Some authorities recommend camphor in combination with opium in the treatment of enteritis.

As an expectorant, camphor forms a frequent constituent of cough mixtures.

Combined with extract of belladonna and chlorate of potash, in the form of electuary, it proves useful in the treatment of laryngitis, pharyngitis, etc.

It was formerly employed in the treatment of chorea in the dog, but other agents are now preferred.

Powdered camphor is prescribed in combination with powdered belladonna, chlorate of potash, etc., in the form of powders, for the treatment of cough in horses, but its taste and smell often cause the patients to refuse it.

Externally, camphor is employed in the form of liniments in cases of strains, bruises, etc. A mild stimulating liniment is prepared with camphor, tincture of arnica, and strong solution of ammonia, as follows: Soft-soap, 2 ounces; tincture of arnica, 4 ounces; spirit of camphor, 4 ounces; strong solution of ammonia, 2 drachms; water to make 1 pint.

The compound liniment of camphor is used as a mild counter-irritant to the throat, etc.

Camphorated oil is employed in canine practice as an application to the thoracic walls and throat in respiratory affections.

Camphor water is employed in preparing expectorant and sedative mixtures and also as a flavouring agent.

Cherry-Laurel Water.

Aqua laurocerasi—Cherry-laurel water—is prepared from the fresh leaves of *Prunus laurocerasus*, the cherry-laurel.

It contains $\frac{1}{10}$ per cent. of hydrocyanic acid; 20 minims are equivalent to 1 minim of the dilute hydrocyanic acid. It is a gastric sedative, but is seldom employed for this purpose.

It is chiefly used as a local sedative for the eye, and it forms an adjunct to eye-lotions, the strength being 1 or 2 parts in 16.

It is occasionally employed to allay itching in cutaneous disorders, but its poisonous nature must be remembered.

Rose-Water.

Aqua rosæ—Rose-water—is prepared from the flowers of *Rosa damascena*.

It is employed in the preparation of various eye-lotions and mouth-washes in canine practice.

Benzoin.

Benzoinum—Benzoin.

A balsamic resin obtained from *Styrax benzoin* and other species of *Styrax*.

Tinctura benzoini composita—Compound tincture of benzoin; Friar's Balsam.

Benzoin, 8; prepared storax, 6; balsam of Tolu, 2; Socotrine aloes, $1\frac{1}{2}$; alcohol, q.s. to yield 80 (1 in 10).

A liquid benzoin compound is also prepared, which is three times the strength of the above tincture.

Unguentum benzoini—Benzoin, 1; adeps, 4.

Acidum benzoicum—Benzoic acid.

PREPARED from benzoin by sublimation; it may also be obtained from other organic compounds.

Ammonii benzoas is prepared by neutralising benzoic acid with solution of ammonia.

Sodii benzoas is prepared by neutralising benzoic acid with sodium carbonate.

ACTIONS AND USES.—Benzoin possesses expectorant and antiseptic actions when given internally; externally, it is a styptic and stimulant when applied to wounds.

The compound tincture of benzoin is occasionally prescribed internally in cases of chronic bronchitis, but is chiefly employed as an inhalation in bronchial and laryngeal affections.

Externally, the compound tincture of benzoin was at one time largely employed as a dressing for wounds, under the familiar name of 'Friar's Balsam.'

It is now used only as a stimulating application in the treatment of unhealthy wounds.

The strong liquid benzoin compound forms an efficient styptic application, and is employed to check hæmorrhage after docking, being applied to the stump by means of a pledget of tow, and the latter kept in its place by securing the hair in a special manner.

Benzoic acid possesses stimulant, expectorant, antipyretic, and diuretic actions. It is said to acidify alkaline urine and to act as a urinary antiseptic. It is occasionally prescribed in cases of cystitis, and is said to be excreted in the form of hippuric acid.

The sodium and ammonium salts of benzoic acid are preferred, as they are less irritating to the alimentary canal, and more soluble. Benzoic acid resembles salicylic acid in its actions; it is toxic only when given in comparatively large doses.

The toxic symptoms observed are tremors and convulsions, followed by paralysis of the limbs; there is marked depression of the heart and respiration; the drug also exerts an irritant action on the gastric mucous membrane.

Sodium benzoate is sometimes prescribed in cases of joint-ill in foals; it is said to reduce the abnormal temperature, and to act favourably on the swollen joints.

Experiments have shown that sodium benzoate is an hepatic stimulant, but it is not employed therapeutically for this purpose.

Balsam of Tolu and Peru.

Balsamum Tolutanum—Balsam of Tolu.

Balsamum Peruvianum—Balsam of Peru.

Balsam of Tolu is obtained from the *Myroxylon Toluifera*.

It possesses expectorant actions, and in the form of syrup of Tolu is added to expectorant mixtures in canine practice.

Balsam of Peru is obtained from the *Myroxylon Pereiræ*.

It contains a volatile oil which is capable of destroying the acari of mange, and hence is employed in the treatment of this affection in delicate house-dogs.

For this purpose it is dissolved in 4 parts of alcohol and applied as a liniment, or employed in the form of an ointment containing 1 part of balsam of Peru in 8 parts of vaseline or lanolin.

Myrrh.

Myrrha—Myrrh.

A gum-resin obtained from *Balsamodendron myrrha*.

It possesses mild astringent actions, and is also a stomachic, a carminative, and an expectorant. Myrrh is often added to electuaries for the treatment of laryngitis, etc., the dose for the horse being 2 drachms.

The tincture of myrrh (1 to 5 of alcohol) forms a constituent of mouth-washes for the treatment of aphtha, etc.

A useful mouth-wash for the dog in cases of spongy gums, etc., is prepared with: myrrh, 1; eau de Cologne, 16; borax, 1; syrup, 3; and water, 3.

Storax.

Styrax præparatus—Prepared storax.

A balsam obtained from the trunk of *Liquidambar orientalis*. It contains free cinnamic acid, styrol, styracin, etc. It resembles balsam of Peru and Tolu, and is employed as an antiseptic and non-irritating parasiticide in certain skin affections of the dog (see Appendix).

Arnica.

Arnicae rhizoma.—The dried rhizome and roots of *Arnica montana*, leopard's bane.

Tinctura arnicae—Tincture of arnica.

One part of arnica rhizome percolated with alcohol to yield 20 parts (1 in 20).

ACTIONS AND USES.—Arnica is a gastro-intestinal stimulant, and, in a reflex manner, it acts as a stimulant to the nervous and circulatory systems. Large doses produce irritant effects on the stomach and intestines, and in the dog cause vomiting, diarrhoea, colicky pains and a feeble pulse.

Arnica is seldom prescribed internally; it was believed to have a special effect in stimulating the cutaneous circulation, and hence its administration was advised in cases of pulmonary congestion; but its action in this respect is very doubtful, and clinical experience does not support it.

Externally, arnica was credited with a special therapeutical value in the treatment of strains, bruises, etc., but many authorities believe that the beneficial effects produced depend on the spirit which the preparation contains. It is sometimes combined with the liquor plumbi subacetatis, and the combination proves useful in cases of inflamed and swollen tendons.

As the tincture of arnica contains tannic acid, it is incompatible with preparations of lead, but its efficacy is not impaired thereby. Arnica is frequently employed as a constituent of stimulating liniments (see p. 328).

Valerian Root.

Valerianæ rhizoma—Valerian rhizome; valerian root.

The dried rhizome and roots of *Valeriana officinalis*.

Tinctura valerianæ ammoniata—Ammoniated tincture of valerian.

DOSES.—Horses, ʒi. to ʒii. ; dogs, ʒss. to ʒi.

ACTIONS AND USES.—Valerian is a nervine stimulant and antispasmodic. It is seldom employed in veterinary practice, and except in large doses has little effect on horses or cattle. It has been prescribed in cases of chorea and epilepsy in the

dog, but not with any beneficial results. The valerianates of sodium, zinc and quinine, are nervine tonics which are seldom prescribed.

Asafetida.

Asafetida, a gum-resin obtained from the root of *Ferula fetida*.

Tinctura asafetidæ—Tincture of asafetida.

One part of asafetida with alcohol to yield 5 parts (1 in 5).

DOSES.—Horses, ʒss. to ʒii.; dogs, ℥xx. to ʒss.

ACTIONS AND USES.—Asafetida is a nervine stimulant, an expectorant, a carminative, and an antispasmodic. It is occasionally prescribed in cases of flatulent colic, in combination with oil of turpentine and raw linseed-oil.

Senega.

Senegæ radix—Senega root.

The dried root of *Polygala senega*.

This is a stimulating expectorant sometimes employed in canine practice in the treatment of chronic bronchitis.

DOSES of the tincture for the dog ʒss. to ʒi., and of the infusion ʒss. to ʒi.

Galbanum and Ammoniacum.

Galbanum and **ammoniacum** are gum-resins resembling asafetida in their actions. They are not employed in veterinary practice.

Pepper.

Capsici fructus—Capsicum fruit.

The dried ripe fruit of *Capsicum minimum*, also known as Chili pepper and chillies. When ground it constitutes the familiar cayenne or red pepper. It contains a number of irritant substances, such as capsinin, capsicol, and capsaicin.

Tinctura capsici—Tincture of capsicum.

One part of capsicum in 20 parts of alcohol.

Piper nigrum—Black pepper.

The dried unripe fruit of *Piper nigrum*. When the outer

covering of the berries is removed before they are ground, white pepper is formed.

ACTIONS AND USES.—The peppers are stimulants, stomachics, and carminatives. Large doses are gastrointestinal irritants.

Capsicum is more irritant than either black or white pepper.

Externally, they exert rubefacient actions.

The tincture of capsicum is a constituent of chlorodyne (see p. 246). Pepper is a popular remedy for colic in horses, but is seldom employed as a therapeutical agent in practice.

Cubebs.

Cubebæ fructus—Cubebs—the dried fruit of *Piper cubeba*, is an aromatic, a stimulant, and an antiseptic diuretic. It has a special action on the genito-urinary mucous membrane, and is prescribed in cases of chronic purulent discharges from the urethra, which occur in canine practice. The tincture of cubebs is usually employed in doses of ʒss. to ʒi.

Copaiba.

Copaiba has actions resembling cubebs, and may be prescribed in combination with it for similar cases. The oil of copaiba is the form usually employed, the dose for dogs being ℥v. to ℥xv.

Oil of Sandal-wood.

Oleum santali—Oil of sandal-wood is distilled from the wood of *Santalum album*.

It has actions resembling those of cubebs and copaiba, and may be prescribed in similar cases, the dose being from 5 to 20 minims.

Mustard.

Sinapis—Mustard.

The powdered and mixed dried ripe seeds of *Brassica nigra* and *Brassica alba*. When mixed with water volatile oil of mustard is formed, and it is on this agent that the activity of the drug depends.

Black mustard is in itself able to produce this volatile oil, but white mustard has not this power; hence it is advisable to combine both varieties.

ACTIONS AND USES.—*Internally*, mustard in medicinal doses is stomachic, carminative, and stimulant.

In cattle practice it is prescribed as a stimulant in combination with carbonate of ammonia and nux vomica, in order to restore nervous tone to the stomach in cases of non-inflammatory gastric affections, with a paralysed condition of the gastric walls. For this purpose doses of from 1 to 2 ounces are given with the agents mentioned, and produce beneficial results (see p. 438).

In the dog, mustard acts as a local emetic, and a dessert-spoonful dissolved in several ounces of water may be employed in cases of poisoning when other agents are not at hand.

Externally, mustard made into a paste with water acts as a rubefacient, and if applied with friction is a vesicant.

Repeated or prolonged applications in irritable conditions of the skin may produce severe effects, with sloughing and destruction of hair-roots.

Mustard is employed as a counter-irritant in the treatment of respiratory affections. The indications for its use will be found at p. 575.

It is made into a paste with tepid water, and applied to the parts, the amount and the degree of friction employed varying according to the effects which it is desirable to produce. Too hot water, or the admixture of vinegar or spirit, prevent the essential oil from being formed, and thus interfere with the activity of the application.

When properly prepared and applied, counter-irritant effects are produced in about twenty minutes, and vesication occurs in from two to six hours. It is preferable to employ repeated mild applications than to depend on one strong dressing. When judiciously employed no blemish results.

It is believed to exert beneficial effects when applied to the abdominal walls in cases of colic and enteritis, and to the region of the kidneys in cases of nephritis.

Oleum sinapis volatile—Volatile oil of mustard, if applied to the skin, produces rapid vesication. When diluted it is sometimes employed as a counter-irritant in canine practice.

Calendula.

The florets of the common marigold. In the form of tinctura calendulæ this agent has been found useful by some practitioners as a surgical dressing for wounds, especially those resulting after operations for sinuses and fistulæ. For this purpose the tincture is diluted with an equal quantity of water.

Aurantium.

Tinctura aurantii—Tincture of orange.

One of fresh bitter-orange peel with 4 of alcohol.

Syrupus aurantii—Syrup of orange.

Tincture of orange, 1; syrup, 7.

USES.—Syrup of orange is employed in canine practice as a flavouring agent for mixtures, especially those containing agents having a nauseous or bitter taste.

CHAPTER XVII

THE VEGETABLE KINGDOM (*continued*)

VEGETABLE PURGATIVES.

Aloes.

BARBADOS aloes is the variety employed in veterinary practice.

Socotrine aloes is a constituent of compound tincture of benzoin (see p. 329).

Aloe Barbadensis—Barbados aloes.

Obtained principally from the leaves of *Aloe vera* and *Aloe chinensis*.

DOSES.—*As a purgative*: Horses, ʒv. to ʒvii.; cattle, ʒi. to ʒii.; sheep, ʒss. to ʒi.; dogs, grs. xv. to ʒi. *As a bitter tonic*, $\frac{1}{8}$ to $\frac{1}{16}$ of these doses is prescribed.

Aloinum—Aloin.

A yellow crystalline powder obtained chiefly from Barbados aloes.

DOSES.—*As a purgative*: Horses, ʒi.ss. to ʒii.; dogs, grs. ii. to grs. x.

ACTIONS.—Aloes is a purgative, and in small doses a bitter tonic. It increases the peristaltic movements, augments the intestinal secretions, and acts chiefly on the large intestines.

The action of aloes as a purgative is slow, and if the horse be unprepared for physic, the ordinary dose may not take effect for sixteen to twenty-four hours after administration. If the animal be properly prepared by feeding on bran-mashes for two days prior to administration, the purgative may take effect in about twelve hours.

In order that aloes may exert its purgative action, it must be subjected to the solvent action of the bile in the intestines, and experiments have demonstrated that aloes is emulsified and saponified by the bile and pancreatic juice.

The purgative action of aloes varies in its duration from three to twenty-four hours.

In some cases ordinary doses of aloes produce no purgative action, but are excreted by the kidneys, exerting a diuretic effect.

In ruminants, the effect of aloes is uncertain; but if combined with other cathartic agents, it assists their action.

In the dog, its action is also uncertain, and, as compared with man, far larger doses are tolerated.

Externally, aloes in the form of solution or tincture is a stimulant and desiccant.

MEDICINAL USES.—Aloes is the purgative usually selected for the horse. Up to the present time, no other agent has been found so safe and reliable.

The drawbacks to its use are: the long period before purgative effects are induced, the nausea which it produces, and the uncertainty of its action in some cases.

It is best given in the form of bolus. The mass from which it is taken should be properly prepared by melting the aloes, and adding glycerine with some volatile oil to prevent hardening and drying. The temperature employed for melting the ingredients should not exceed 120° F., otherwise the activity of the drug becomes impaired.

In order to prevent griping, it is advisable to combine 2 drachms of powdered ginger, 20 grains of extract of belladonna or hyoscyamus, and 10 minims of oil of peppermint, with each physic ball.

Some practitioners advise the addition of powdered gentian, and believe that it increases the activity of the aloes.

The late Professor Robertson advised the combination of 4 drachms of aloes, 1½ drachms of powdered gentian, and ½ drachm of calomel, and found this to produce an action equal to 6 drachms of aloes ('Equine Medicine').

Physic balls are now prepared by wholesale chemists in a

reliable manner, and are neatly covered with gelatine, which preserves their activity for a long period. This form of bolus is far more easily administered than the old-fashioned variety.

In prescribing aloes, it is not always an easy matter to compute the dose that is necessary to induce a reasonable purgative action. An insufficient amount is apt to be retained a long time in the system and to cause extreme nausea.

In cases where the ordinary dose fails to act, it is not safe to administer another until forty-eight hours have elapsed.

Certain *precautions* are necessary when prescribing aloes. The horse should be properly prepared for physic. About twelve hours after administration gentle walking exercise hastens the action of the drug; but when purging has commenced the animal should be kept in his stall and properly clothed. Cold water must be withheld, but warm drinks should be allowed instead, and bran-mashes should constitute the diet until purging has ceased.

Green foods, roots, etc., should be rigidly interdicted, and on no account should the animal be worked until the physic has 'set.'

Neglect of these precautions may give rise to serious results, such as superpurgation, and even a fatal termination from exhaustion of the vital powers.

Sometimes, in consequence of individual idiosyncrasies to the action of the drug, a moderate dose may induce superpurgation, or even a fatal termination. Laminitis has supervened in some instances.

These results may occur in spite of all precautions, and the practitioner who prescribes the drug cannot be held responsible.

Such unfortunate consequences, however, are rare, and by paying attention to the points above mentioned and to the contra-indications which we shall presently notice, properly-regulated doses are usually safe.

Superpurgation from aloes will require appropriate treatment. If no constitutional disturbance be present, it would

be irrational to adopt measures to check the purging; demulcent drinks, such as thin flour-gruel, should be allowed, and the animal kept warmly clothed.

If the purging continue, and if in addition there be disturbance of the pulse, loss of appetite, or colicky pains present, it will be necessary to check the purging gradually.

For this purpose, and to relieve the pain, 2 ounces of the tincture of opium, or 1 ounce of chlorodyne, with 2 ounces of prepared chalk, 2 ounces of compound tincture of camphor, and 1 quart of flour-gruel, are to be administered every four hours until relief be obtained.

In cases where prostration is marked, full doses of brandy or port wine should be added to the above.

The administration of aloes is recommended by many practitioners in the treatment of spasmodic colic.

The value of this method of treatment is a question on which difference of opinion exists (see p. 454).

In cases of impaction of the colon, the late Professor Williams advised an enema composed of 2 ounces of aloes in 1 pint of warm water, administered at a temperature of 90° F.

Contra-indications of Aloes.—In inflammatory conditions of the alimentary canal, such as enteritis, also in peritonitis, volvulus, etc., aloes should not be prescribed.

In obstruction of the intestines from any cause, and in impaction of the colon, with paralysis of its walls, aloes should be avoided, as it is likely to produce rupture of the intestine.

In catarrhal or respiratory affections aloes is contra-indicated, and in all cases of a debilitating nature this drug should not be prescribed, as not only is there a danger of superpurgation ensuing, but also the system becomes weakened and less able to withstand the effects of disease. It is also contra-indicated during pregnancy and in cases of laminitis, milder purgatives being safer and quite as effectual. It should not be employed as a purgative for young animals, nor in irritable conditions of the intestinal canal.

Aloes is not a reliable purgative for cattle, but is occasionally combined with other cathartic agents, such as Epsom salt and gamboge.

Dogs require comparatively large doses to induce purgation, but the drug is not prescribed for this purpose in canine practice, except in combination with other agents.

As a bitter tonic, aloes is occasionally prescribed for the horse in cases of convalescence from acute indigestion. In such instances the late Professor Robertson advised the administration once daily of 1 drachm each of aloes, asafetida, gentian, and ginger in the form of bolus.

Aloes is occasionally prescribed in the form of infusion as a drench, but in consequence of its nauseous taste it is difficult to administer in this manner.

Aloin has been found by some practitioners to be superior to aloes as a purgative for the horse. It is said to cause less nausea and less tendency to griping, while the dose required is about one-third the quantity of aloes requisite as a purgative. Thus, 2 drachms of aloin, administered to horses properly prepared, produced effects in thirteen to fourteen hours equivalent to those of 6 drachms of aloes.

In some instances purging was induced in twelve hours, and in every case there was less nausea than is usual as the result of the administration of aloes.

Further trial is required before the superiority of this agent over aloes can be definitely determined.

Rhubarb.

Rhei radix—Rhubarb root.

It consists chiefly of the rhizomes of *Rheum palmatum* and other species.

DOSES OF POWDERED RHUBARB.—For foals and calves, ℥ii.; dogs, grs. xv. to ʒss. As a stomachic tonic for the dog, grs. iii. to grs. x., for repeated administration.

Tinctura rhei composita—Compound tincture of rhubarb.

DOSE.—For the dog, ʒss. to ʒi.

ACTIONS AND USES.—Rhubarb, even in large doses, has no purgative effect on horses or cattle. In the dog it is a carthartic in full doses, but this effect is followed by an astringent action. Small doses exert stomachic, tonic, and astringent actions. It is sometimes prescribed in cases of diarrhœa in combination with sodium bicarbonate and peppermint-water. Combined with calomel, it forms a purgative and cholagogue for the dog. In cases of obstinate diarrhœa in foals and calves, rhubarb combined with carbonate of magnesia and ginger is often found effectual. In some instances it is advisable to combine with the above $\frac{1}{2}$ drachm of chlorodyne and 1 ounce of brandy, and to administer them twice daily in well-boiled wheat-flour gruel.

Senna.

Senna, the dried leaflets of *Cassia acutifolia* and *Cassia augustifolia*, is a purgative agent which is not employed in veterinary practice.

Buckthorn.

Syrupus rhamni—Syrup of buckthorn.

A syrup prepared from the berries of *Rhamnus catharticus*, or purging buckthorn.

It is employed in doses of $\bar{3}$ i. to $\bar{3}$ ii. as a mild aperient for the dog, and may be added to carthartic mixtures to disguise the taste of nauseous agents contained therein.

Cascara Sagrada.

Cascara sagrada—The dried bark of *Rhamnus purshianus*.

Extractum cascarae sagradae—Extract of cascara sagrada.

DOSE.—For dogs, grs. ii. to grs. viii.

Extractum cascarae sagradae liquidum—Liquid extract of cascara sagrada.

DOSE.—For dogs, $\bar{3}$ ss. to $\bar{5}$ i.

A reliable preparation of cascara, known as cascara evacuant, is prepared by Messrs. Parke, Davis and Co.,

London. In doses of 10 to 15 minims it acts as a laxative for the dog, and 20 to 30 minims produce gentle purgative effects.

ACTIONS AND USES.—Cascara is a tonic laxative. It is chiefly employed in cases of chronic constipation in the dog, depending on an atonic condition of the stomach and intestines. It is best given in small doses twice daily, the amount being gradually reduced as the normal action of the intestines returns.

Jalap.

Jalapa—Jalap.

The dried tubercles of *Ipomœa purga*. It contains an active resin, consisting chiefly of the glucoside convolvulin.

DOSES OF POWDERED JALAP.—Dogs, ʒss. to ʒii.; pigs, ʒi. to ʒiv.

ACTIONS AND USES.—Jalap is a hydragogue cathartic and cholagogue. It stimulates the secretion of bile and increases to a marked extent the secretion from the intestinal glands. Even in large doses it has little effect on horses or cattle. It is an effectual purgative for the pig, especially if combined with calomel. At one time it was a favourite cathartic for the dog, but a combination of purgative agents in small bulk is now found more effectual for this purpose, and less liable to induce vomiting or nausea.

Scammony.

Scammoniaë resina—Scammony resin, obtained from the root of *Convolvulus scammonia*—resembles jalap in its actions, but is more irritating to the gastro-intestinal canal. It is not prescribed alone, but forms one of the constituents of the colocynth and hyoscyamus pill, and of the compound extract of colocynth.

Colocynth.

Colocynthidis pulpa—Colocynth pulp.

The dried pulp of the fruit of *Citrullus colocynthis*.

Pilula colocynthidis composita—Compound pill of colocynth.

Colocynth pulp, 1; Barbados aloes, 2; scammony resin, 2; potassium sulphate, $\frac{1}{4}$; oil of cloves, $\frac{1}{4}$; distilled water, q.s.

DOSE.—For dogs, grs. iv. to grs. viii.

Pilula colocynthis et hyoscyami—Pill of colocynth and hyoscyamus.

Compound pill of colocynth, 2; extract of hyoscyamus, 1.

DOSE.—For dogs, grs. iv. to grs. x.

ACTIONS AND USES.—Colocynth is a powerful hydragogue cathartic. It is not prescribed for horses or cattle, but, in combination with other agents, it is one of the most useful purgatives for the dog. In the form of the pill of colocynth and hyoscyamus it may be combined with either calomel or blue pill, and is far preferable to the drastic and nauseating purgatives which at one time were prescribed in canine practice. The dose will vary according to the size of the animal.

Sugar-coated pills containing suitable doses are now prepared by wholesale chemists, and are very convenient and reliable.

Podophyllum.

Podophylli resina—Podophyllum resin—also known as podophyllin.

PREPARED from the dried rhizome of *Podophyllum peltatum*, the American mandrake or May-apple.

DOSES.—Horses, $\bar{\text{5i}}$. to $\bar{\text{5ii}}$.; dogs, gr. $\frac{1}{4}$ to gr. i.

Pilula podophylli composita—Compound podophyllum pill.

Podophyllum resin, gr. $\frac{1}{4}$; Barbados aloes, gr. i.; green extract of belladonna, gr. $\frac{1}{4}$; capsicum, gr. $\frac{1}{2}$.

DOSE.—For dogs, one to two pills.

Tinctura podophylli—Tincture of podophyllum.

Fifteen minims are equivalent to $\frac{1}{2}$ grain of podophyllum resin.

DOSE.—For dogs, $\mathfrak{M}\text{v}$. to $\mathfrak{M}\text{xv}$.

Tinctura podophylli ammoniata—Ammoniated tincture of podophyllum.

Podophyllum resin, 1; aromatic spirits of ammonia, 50.

DOSE.—As a purgative and cholagogue for the dog, ℥x. to ℥xx., diluted with water.

This tincture can be mixed with water without separation of the resin occurring. The sal volatile also acts as a corrective to any griping action.

ACTIONS AND USES.—Podophyllum is uncertain in its actions in horses and cattle, and ordinary doses usually produce no effect. In the dog, small doses increase the secretion of bile, and have a laxative effect ; full doses act as purgatives, but usually cause irritation and griping. As a purgative and cholagogue the drug is combined with calomel and other agents. In congestion and torpidity of the liver, small doses of the ammoniated tincture sometimes give good results.

The compound podophyllum pill may be prescribed in similar cases.

Gamboge.

Cambogia—Gamboge.

A gum-resin obtained from *Garcinia Hanburii*.

DOSE.—For cattle, ʒss. to ʒi.

ACTIONS AND USES.—Gamboge is a drastic hydragogue cathartic. It is far too irritant for horses or dogs, but is occasionally prescribed in combination with other purgatives for cattle in cases where free purgation is indicated, such as cerebral affections depending on gastric disorders. One ounce of gamboge, with $\frac{1}{2}$ pound each of Epsom and common salt, dissolved in a pound of treacle and a quart of water, form an effectual purgative drench ; or 1 ounce each of gamboge and aloes in solution may be employed (see Appendix).

Elaterium.

Elaterium—Elaterium.

PREPARED from the juice of the fruit of *Ecballium elaterium*, the squirting cucumber.

DOSE.—For dogs, gr. $\frac{1}{20}$ to gr. ss.

Elaterin is the active principle of elaterium.

DOSE.—For dogs, gr. $\frac{1}{60}$ to gr. $\frac{1}{10}$.

Pulvis elaterini compositus — Compound powder of elaterin.

Elaterin, 1; milk-sugar, 39.

DOSE.—For dogs, gr. i. to grs. iv.

ACTIONS AND USES.—Elaterium is a powerful hydragogue cathartic, producing very watery motions, its action being accompanied by much irritation of the intestinal canal and by depression. It is occasionally prescribed in cases of dropsy depending on renal or hepatic disease in the dog. In consequence of its irritant and depressing action, other agents are far safer. Elaterium is not employed for horses or cattle.

Croton-Oil.

Oleum crotonis—Croton-oil.

The oil expressed from the seeds of *Croton tiglium*.

DOSES.—Horses, ℥x. to ℥xx.; cattle, ʒss. to ʒi.

Linimentum crotonis—Liniment of croton-oil.

Croton-oil, 1; oil of cajuput, $3\frac{1}{2}$; alcohol, $3\frac{1}{2}$.

ACTIONS AND USES.—Croton-oil is a powerful drastic hydragogue cathartic, which acts with great rapidity, causing frequent full fluid dejections. In large doses it is an irritant poison, causing gastro-enteritis, collapse, and death. In some instances even medicinal doses may produce serious intestinal irritation and superpurgation.

Externally, it is an irritant, and when rubbed into the skin produces an eruption, which becomes pustular. The pustules heal slowly, and are apt to leave a blemish.

In consequence of its irritating and depressing action, croton-oil is seldom employed for the horse. It is occasionally useful in cases of phrenitis and meningitis in the earlier stages, where it is desirable to obtain speedy and complete purgation, and a diminution of arterial pressure by diverting the blood to the intestinal bloodvessels.

In cattle it is sometimes prescribed in gastric affections complicated with cerebral symptoms; but its use requires judgment, as many of these cases depend on an inflammatory condition of the abomasum, in which the drug would be contra-indicated. In the present day drastic purgatives are

far less used in cases of obstinate constipation than in former times, as nerve tonics, stimulants, and milder cathartics give far better results. Many instances of cessation of rumination and obstinate constipation in cattle depend on a paralysed condition of the gastric and intestinal walls, and violent purgatives do more harm than good.

Croton-oil may be administered in linseed-oil or in mucilage. It is not prescribed in canine practice, being far too irritating and violent in its actions.

Externally, croton-oil is employed as a counter-irritant for cattle in the form of linimentum crotonis. It may be added to the ordinary blistering ointments in the proportion of 1 to 8. It is not used as a counter-irritant for horses.

Castor-Oil.

Oleum ricini—Castor-oil.

The oil expressed from the seeds of *Ricinus communis*, the castor-oil plant. The active principle is said to be *ricinoleic acid*.

DOSES.—Horses and cattle, O.i.; sheep and pigs, $\bar{5}$ ii. to $\bar{5}$ iv.; dogs, $\bar{5}$ ii. to $\bar{5}$ ii. (according to size); foals and calves, $\bar{5}$ ii. to $\bar{5}$ iii.

ACTIONS AND USES.—*Externally*, pure castor-oil lessens irritation, and acts as a protective. A few drops applied to the conjunctiva lessen irritation after the removal of foreign bodies from the eye; and it is also employed as a local application after injuries to the eye by caustic substances, such as acids or alkalies.

Internally, it is a simple purgative, mild in its actions and free from any tendency to cause griping. It acts by increasing both peristalsis and intestinal secretion; it becomes emulsified by the bile and pancreatic secretion, and in part is absorbed, but the major portion is excreted by the intestines unchanged.

For the horse, castor-oil is an uncertain purgative, and produces extreme nausea. In foals, however, it is safe and reliable; and in cases of intestinal obstruction depending on retention of the meconium the administration of castor-oil in a dose of a wineglassful, repeated if necessary, can-

stitutes the routine treatment, enemata of warm olive-oil being given at the same time (see p. 469).

In cattle, castor-oil is a popular purgative agent, and is often given in large doses ; but in our experience raw linseed-oil gives better results.

In canine practice castor-oil is largely employed as a purgative. One drawback to its use is its tendency to induce vomition when the stomach is in an irritable condition. To obviate this emulsions of the drug are prescribed.

A useful mixture is prepared by combining equal parts of castor-oil and olive-oil, and adding from 10 to 20 minims of sweet spirit of nitre, and $\frac{1}{2}$ minim of oil of peppermint or aniseed. Or the British Pharmacopœia *mistura olei ricini* may be employed. This consists of mucilage of gum acacia, $1\frac{1}{2}$; castor-oil, 3 ; orange-flower-water (undiluted), 1 ; and cinnamon-water, $2\frac{1}{2}$, the dose being from 1 to 3 ounces.

In cases of diarrhœa in foals, calves, and dogs, a moderate dose of castor-oil is indicated as the preliminary step in treatment. In severe cases a dose of chlorodyne may be combined with the oil (see p. 472).

It is important that the purest form of castor-oil should be prescribed in canine practice.

Linseed-Oil.

Oleum lini—Raw linseed-oil.

The oil expressed from the seeds of *Linum usitatissimum* (linseed) at ordinary temperatures.

DOSES.—Horses, O.i. to O.i.ss. ; cattle, O.i.ss. to O.ii. ; sheep and pigs, $\bar{\text{v}}$ iv. to $\bar{\text{v}}$ vi. ; dogs, $\bar{\text{v}}$ ii. to $\bar{\text{v}}$ ss.

ACTIONS AND USES.—In small doses linseed-oil is a laxative, in full doses it is a mild purgative. It is largely prescribed in equine practice for cases in which active cathartics would be contra-indicated. In spasmodic colic, flatulent colic, and impaction of the colon, it is administered as an oleaginous purgative in combination with other agents. The action of linseed-oil is uncertain at times, and full repeated doses may induce superpurgation and laminitis. The extreme nausea which it produces in the horse renders

its employment in large doses undesirable. It may be given in the form of enema in cases of impaction of the colon.

In cattle practice, full doses of linseed-oil are prescribed in gastric affections where active or irritating cathartics would be productive of undesirable results.

As a menstruum, to prevent the irritating effects of agents such as oil of turpentine, linseed-oil is frequently employed.

In canine practice, linseed-oil is a safe and mild purgative, but as it tends to induce nausea, it is liable to be rejected in irritable conditions of the stomach.

Small doses are readily taken by horses in their food, and prove useful in aiding digestion and improving nutrition.

Externally, linseed-oil is employed as a basis for various liniments in the treatment of parasitic skin diseases. Combined with equal parts of lime-water it forms carron-oil, which is a useful application for burns and scalds.

It is important to remember that boiled linseed-oil, containing litharge, is used in the preparation of paints, and if substituted for the raw linseed-oil, toxic effects may be produced.

Euonymin.

Euonymin, obtained from the root-bark of *Euonymus atropurpureus*, is a cholagogue and purgative, occasionally prescribed in canine practice in the treatment of chronic constipation and torpid liver.

The dose for the dog is from 1 to 2 grains, which may be combined with other agents possessing similar actions.

Iridin.

Iridin, obtained from the root of *Iris versicolor*, has similar actions to the above, and may be combined with it in doses of 1 to 5 grains, or with other cholagogues.

CHAPTER XVIII

THE VEGETABLE KINGDOM (*continued*).

Male-Fern.

Filix mas—Male-fern—the rhizome of *Aspidium filix mas*.

The drug is chiefly used in the form of the liquid extract. This is an oleo-resin, and is sometimes called oil of male-fern.

Extractum filicis liquidum—Liquid extract of male-fern.

The active constituents of the drug are *aspidin* and *filicic acid*.

DOSES.—Horses, ʒii. to ʒvi.; dogs, ʒxv. to ʒi. Administered in the form of emulsion with mucilage of gum acacia, or preferably in capsules.

ACTIONS AND USES.—Male-fern is an anthelmintic which is especially destructive to tape-worms, and it is one of the most effectual drugs for this purpose. In administering this agent it is advisable to give a purgative the previous day, and also on the day after the drug has been taken. Some authorities advise the dose to be divided into three parts, and each to be given at intervals of half an hour.

In large doses, or where some unknown conditions favour the absorption and retention of a large amount of the active constituents, serious symptoms may occur in the dog. These usually consist of vomiting, purging, colicky pains, muscular weakness, slight convulsive movements or muscular twitching, occasionally blindness, and where toxic doses have been given, death results from collapse.

In medicinal doses, the quantity of the active constituents absorbed should be so small as not to produce any constitu-

tional symptoms, the major portion of the drug escaping with the contents of the intestine.

The dose for the dog should be carefully computed, having regard for the size and strength of the individual. The drug is best administered in the form of capsules, and in cases where no results follow its employment, the dose should not be repeated until several days have elapsed.

For the horse, it may be combined with oil of turpentine and administered in linseed-oil.

As oil dissolves the filicic acid and thus promotes its absorption, some authorities state that it is not safe to combine male-fern with oleaginous substances.

Santonin.

Santoninum—Santonin—a crystalline principle obtained from santonica or wormseed, the dried flower-heads of *Artemisia maritima*.

This must be distinguished from American wormseed, which is obtained from chenopodium (see p. 352).

DOSES.—Horses, ʒss. to ʒi. ; dogs, grs. ii. to grs. v.

ACTIONS AND USES.—Santonin is an anthelmintic which is especially destructive to round-worms and thread-worms. A certain amount of a medicinal dose becomes absorbed from the stomach, but sufficient passes into the intestine to act on the parasites therein. Authorities are not agreed as to the exact action of santonin on intestinal worms. Some believe that the parasites become narcotised, and are carried away in the fæces. Others state that solutions of the drug are not fatal to the parasites outside the body, and that the worms are often found in active movement when passed after santonin had been given internally. They conclude that the action of santonin renders the intestine so unpleasant an abode for the parasites, that the latter migrate into the large intestine, and are removed by the purgative which is usually given with the drug. Santonin is excreted by the intestines and also by the kidneys, and gives a deep yellow colour to the urine.

In administering the drug to dogs it is necessary to exercise caution, as too large doses may induce toxic symptoms, as follows: twitching of the muscles of the head, rolling of the eyes, temporary blindness, grinding of the teeth, clonic spasms, and epileptiform convulsions. Toxic doses cause irregular and insufficient respiration and death from asphyxia. The antidotes are emetics and purgatives.

Santonin is best administered with castor-oil; this assists in the removal of the parasites, and also causes less of the drug to become absorbed. It is advisable to administer another dose of castor-oil in about six hours afterwards.

Santonin combined with other agents is effectual in eradicating round-worms from puppies, but it is not advisable to prescribe this agent until the animals are past eight weeks old.

The following is a useful formula: Santonin, grs. iv.; oil of chenopodium, ℥xx.; oil of turpentine, ℥iii.; oil of aniseed, ℥xvi.; castor-oil, ʒv.ss.; olive-oil, ʒii. Mix. Of this, the dose for puppies eight weeks old and of ordinary size is 1 drachm; and if no effect is produced on the bowels, it may be repeated in two hours, along with 1 or 2 drachms of castor-oil. For small puppies reduce the dose to one-half, and for the toy breeds to one-quarter.

At the fourth month the dose is $1\frac{1}{2}$ drachms; at the seventh month the dose is $2\frac{1}{2}$ drachms; at the thirteenth month the dose is 3 drachms.

Santonin is not a reliable vermicide for either horses or cattle.

Oil of American Wormseed.

Oleum chenopodii—Oil of American wormseed.

A volatile oil distilled from the fruit of *Chenopodium ambrosioides*, the Jerusalem oak.

DOSES.—Dogs, ℥ii.; to ℥xxx.; for puppies, ℥i. to ℥ii.

ACTIONS AND USES.—Oil of chenopodium is a reliable anthelmintic for round-worms in puppies, and can be given at an age when santonin or areca-nut would not be safe agents. It is best administered with castor-oil and olive-oil.

The following formula is safe and effectual for this purpose : Oil of chenopodium, ℥xvi.; oil of turpentine, ℥ii.; oil of aniseed, ℥xvi.; castor-oil, ℥iii.ss.; olive-oil, ℥iii. Mix and heat gently.

DOSES.—For a full-sized or medium puppy under six weeks old, give $\frac{1}{2}$ drachm in a drachm of milk. Between six and eight weeks the dose is 1 drachm, and at eight weeks 1 drachm, to be repeated in an hour.

If the bowels do not act within an hour, give $\frac{1}{2}$ drachm to 1 drachm of castor-oil. For small puppies reduce the doses to one-half, and for the toy breeds to one-quarter.

If no worms are expelled, the mixture may be repeated in a few days.

Areca.

Areca—the seed of *Areca catechu*, the betel-nut tree; also known as areca-nut.

DOSES.—Horses, ℥iv. to ℥vi.; dogs, grs. x. to ℥i.

Arecoline is the chief alkaloid found in areca. It is employed in the form of arecoline hydrobromide.

DOSES.—For the horse $\mathfrak{z}\frac{2}{3}$ to ℥i.ss., dissolved in a drachm of distilled water and injected subcutaneously.

ACTIONS AND USES.—Powdered areca-nut is an anthelmintic. It is largely employed as a vermifuge for both tape and round worms in the dog.

The usual dose is about 2 grains for every pound of the animal's weight. Too large doses may induce narcotic effects, or cause convulsions, and it is not advisable to prescribe this agent for young puppies.

Areca-nut should be freshly ground, and is best administered in milk, a dose of castor-oil being given before and after the administration. Some prefer to give the drug along with a dose of raw linseed-oil, and the combination is very effectual. For the eradication of tape-worm it is advisable to combine the areca-nut with half a dose of the extract of male-fern.

Mr. Henry Gray, M.R.C.V.S., Kensington, is of opinion that areca-nut is not a safe agent to administer to puppies

under six months of age, nor should it be given to dogs suffering from incipient distemper, catarrhal enteritis, or in cases where infrequent cardiac action is present. In such instances serious, if not fatal, results may ensue from the effects of this agent.

He also finds that areca-nut is not an astringent, but an intestinal stimulant, and that by causing an outpouring of mucus and inducing increased peristalsis, it loosens the grip of the tape-worm in the intestine and sets it free; hence it is a vermifuge, and not a vermicide, as is usually stated.

Mr. Gray advises that if the drug be given dry it should not be placed on the tongue, but in the buccal pouch, as if the former method be adopted, it may be drawn into the bronchial tubes and induce bronchial catarrh.

Areca-nut may be dissolved in hot water and administered when cool by pouring it slowly into the buccal pouch.

After administration, exercise and enemata are advised, so as to prevent the drug remaining too long in the stomach and intestines.

He does not consider areca-nut safe for cats, as it may cause an outpouring of bronchial mucus, and so induce bronchial catarrh, but prefers kamala for this animal, the dose being from 10 to 15 grains.

Arecoline hydrobromide possesses sialogogue, diaphoretic, and vermifuge actions; it also stimulates energetically the peristaltic movements of the intestines, and causes contraction of the pupil. It thus resembles in its actions eserine and pilocarpine. In medicinal doses it is a cardiac sedative, diminishing the force and number of the pulsations.

Arecoline is recommended by Continental authorities in the treatment of laminitis, and also in colic complicated with fæcal obstruction.

It is said to favourably influence the course of an attack of laminitis, but the explanation of its action in this respect is not clear. With reference to its use in obstructive colic, we see nothing to recommend it in preference to eserine and pilocarpine.

Tænaline and **Tænigen** are proprietary preparations containing the anthelmintic principles of areca-nut ; they are safe and effectual for canine practice.

Kamala consists of the minute glands and hairs obtained from the surface of the fruits of *Mallotus Philippinensis*. It possesses anthelmintic and purgative actions and is employed for the eradication of tapeworm in cats (see p. 354).

There are other drugs which possess anthelmintic actions, such as cusso or kousso, spigelia, and granatum or pomegranate bark ; but as they are seldom employed in veterinary practice, they do not merit consideration here.

CHAPTER XIX

THE VEGETABLE KINGDOM (*continued*)

Galls.

Galla—Galls.

Excrescences on a species of oak-tree, the *Quercus infectoria*, resulting from the puncture and deposition of the ova of *Cynips gallæ tinctoriæ*.

Unguentum gallæ—Gall ointment.

Galls, 1; benzoated lard, 4.

Unguentum gallæ cum opio—Gall and opium ointment.

Opium, $7\frac{1}{2}$ grains; gall ointment, $92\frac{1}{2}$ grains.

Acidum tannicum—Tannic acid; tannin—is prepared from galls.

DOSES.—Horses, ʒss. to ʒii.; dogs, grs. ii. to grs. v.

INCOMPATIBLES.—Mineral acids, alkalies, lead and silver, ferric salts, vegetable alkaloids, and gelatine.

Acidum gallicum—Gallic acid—is prepared from tannic acid.

DOSES.—Similar to those of tannic acid.

ACTIONS AND USES.—Tannic acid is a styptic and astringent. Gallic acid is inferior to tannic acid as an astringent. The latter is said to be converted into gallic acid in passing through the circulation. Its action in arresting hæmorrhage from remote vessels is not now believed in. Tannic acid precipitates albumin and also proteids in the stomach; but as digestion proceeds the combination is broken up, as the peptones do not combine with tannin in acid solutions. It exerts an astringent action on

the walls of the stomach and intestines. If the stomach be comparatively empty, the effect of tannic acid therein may be to induce vomiting in the dog.

Externally, if applied to abrasions of the skin or to mucous surfaces, it constricts the tissues of the parts, diminishes the local circulation, and reduces the sensibility of the nerve-endings.

Many vegetable astringents contain tannic acid, and to this agent is to be attributed their special action.

Tannic acid is seldom prescribed internally, agents containing it, such as catechu and kino, being preferred as intestinal astringents. Its action as a styptic in cases of internal hæmorrhage is doubtful, and other agents are found to be more reliable.

Externally, tannic acid, combined with glycerine (1 to 5), is sometimes employed as an astringent application in cases of eczema with excessive secretion.

A similar combination is applied to the pharynx in relaxed conditions of the mucous membrane of this region which are met with in canine practice.

As an *antidote to alkaloids*, tannic acid acts by forming insoluble compounds with the toxic agents; but unless these are promptly got rid of by emetics in the dog and purgatives in the horse, the toxic principles become liberated; hence the antidote is but a temporary one.

The gall and opium ointment is employed as a local application in the treatment of hæmorrhoids in the dog.

Tannalbin is a combination of tannic acid and albumin, dried at such a temperature that it is unaffected by the gastric juice, but is capable of being broken up in the intestine, exerting an astringent and disinfectant action on the mucous membrane; thus, any irritating effect of the drug on the stomach is avoided.

In doses of 20 to 40 grains it has been employed in cases of diarrhœa and dysentery in foals and calves, being repeated three times daily.

Tannigen, a compound of tannin with acetic acid, has similar actions and uses to the above. It is recommended in

cases of intestinal catarrh in foals depending on the presence of parasites.

Pyrogallic acid is obtained from gallic acid. It possesses antiseptic, astringent, and caustic actions, and has been recommended in the local treatment of psoriasis and ring-worm. In consequence of its irritant action and the risk of absorption from the skin, it is seldom employed.

Catechu.

Catechu—Catechu.

An extract of the leaves and young shoots of *Uncaria Gambier*.

Catechu nigrum—Black catechu.

A dried extract from the wood of *Acacia catechu*.

DOSES.—Horses, ʒi. to ʒiii.; cattle, ʒii. to ʒvi.; sheep and pigs, ʒss. to ʒii.; dogs, grs. v. to grs. xv.

Tinctura catechu—Tincture of catechu.

Catechu, 4; cinnamon bark, 1; alcohol, 20 (1 in 5).

DOSES.—Horses, ʒi. to ʒii.; dogs, ʒss. to ʒi.

Pulvis catechu compositus—Compound powder of catechu.

Catechu, 4; kino, 2; krameria root, 2; cinnamon bark, 1; nutmeg, 1.

DOSES.—Horses, ʒiii. to ʒvi.; dogs, grs. x. to grs. xv.

INCOMPATIBLES.—The alkalies, metallic salts, and gelatine.

ACTIONS AND USES.—Catechu is a powerful astringent, resembling tannic acid in its actions. It is prescribed in cases of persistent diarrhœa and also in dysentery, being combined with prepared chalk and a carminative such as powdered ginger. In severe cases opium may be added with benefit, and the combination is best administered in well-boiled flour-gruel (see p. 474).

The compound catechu powder may be employed for similar purposes.

Kino.

Kino—Kino.

The juice obtained from incisions in the trunk of *Pterocarpus marsupium*.

The actions, uses, and doses are similar to those of catechu.

Pulvis kino compositus—Compound powder of kino.

Kino, 15; opium, 1; cinnamon bark, 4.

This is sometimes prescribed for obstinate cases of diarrhœa in dogs in doses of from 5 to 20 grains.

Krameria.

Krameriaæ radix—Krameria; also known as rhatany root.

The dried root of *Krameria argentea* or of *Krameria triandra*.

Krameria resembles catechu in its actions; it is one of the components of compound catechu powder.

Cinnamon.

Cinnamomi cortex—Cinnamon bark.

The dried inner bark of shoots from the truncated stocks of *Cinnamomum zeylanicum*.

Oleum cinnamomi—Oil of cinnamon.

Obtained by distillation from cinnamon bark.

ACTIONS AND USES.—Cinnamon possesses carminative, astringent, aromatic, stimulant, and antiseptic actions. It is chiefly used as an adjuvant to other medicines, and is one of the components of compound catechu powder.

The oil of cinnamon has been found useful in the treatment of diarrhœa in the dog, the dose being ℥i. to ℥iv. in syrup or mucilage.

Tincture of cinnamon may be prescribed for a similar purpose in doses of ʒi. to ʒii.

Logwood.

Hæmatoxyli lignum—Logwood.

The heart-wood of *Hæmatoxylon campechianum*.

Decoctum hæmatoxyli—Decoction of logwood.

DOSES.—Horses and cattle, ʒvi. to ʒviii.; dogs, ʒii. to ʒi.

A liquid extract and a dry extract are also prepared. Doses about one-eighth of the above.

ACTIONS AND USES.—Hæmatoxylon is an astringent. It is said to be without irritating properties, and not to cause

subsequent constipation. It is occasionally prescribed in cases of obstinate diarrhœa in cattle, also in dysentery. In combination with dilute sulphuric acid and infusion of cloves, it forms the most efficient remedy in cases of obstinate diarrhœa in the dog (see p. 485).

Hamamelis.

Hamamelidis cortex et folia.—The dried bark and the fresh and dried leaves of *Hamamelis virginica*, the witch-hazel.

Extractum hamamelidis liquidum—Liquid extract of hamamelis.

A proprietary preparation of witch-hazel is known as hazeline. A concentrated distilled extract of witch-hazel is also prepared. These are more reliable than the official liquid extracts.

DOSE.—For dogs, ℥v. to ℥xv.

ACTIONS AND USES.—Hamamelis possesses astringent and hæmostatic actions, both locally and internally. It is a capillary astringent, and hence is employed as an injection in cases of epistaxis. It is also employed in canine practice in cases of hæmoptysis and hæmatemesis. In the form of ointment prepared with lanolin (1 in 10), it is a useful application for hæmorrhoids in the dog.

Chrysarobin.

Chrysarobinum—Chrysarobin.

A yellow crystalline powder prepared from araroba, or goa powder, which is obtained from fissures in the trunk of *Andira araroba*.

When chrysarobin is oxidised, an agent known as chrysophanic acid is formed.

ACTIONS AND USES.—Chrysarobin is a parasiticide, and in the form of ointment (1 part in 25 parts of benzoated lard) it is sometimes employed in the treatment of ringworm. It is also found useful in cases of chronic psoriasis, but is liable to produce much irritation of the skin.

Ipecacuanha.

Ipecacuanhæ radix—Ipecacuanha root.

The dried root of *Psychotria ipecacuanha*. The principal alkaloids contained in ipecacuanha are *emetine* and *cephaëline*.

DOSES OF POWDERED IPECACUANHA.—Horses, $\bar{5}i.$ to $\bar{5}i.ss.$; dogs, gr. $\frac{1}{4}$ to grs. ii.; as an emetic, grs. xv. to $\bar{5}ss.$

Vinum ipecacuanhæ—Ipecacuanha wine.

Liquid extract of ipecacuanha, $\bar{1}$; sherry, $\bar{1}9$ ($\bar{1}$ in 20).

DOSES.—Horses, $\bar{5}ii.$ to $\bar{5}i.$; dogs, as an expectorant, $\bar{3}x.$ to $\bar{5}ss.$; as an emetic, $\bar{5}iv.$ to $\bar{5}vi.$

INCOMPATIBLES.—Lead and mercury salts, vegetable acids, astringent infusions.

Pulvis ipecacuanhæ compositus—Compound powder of ipecacuanha; Dover's powder.

Ipecacuanha root, $\bar{1}$; opium, $\bar{1}$; potassium sulphate, $\bar{8}$ ($\bar{1}$ ipecacuanha, $\bar{1}$ opium, in $\bar{1}0$). One grain of Dover's powder is equivalent to gr. $\frac{1}{10}$ of opium.

DOSES.—Horses, $\bar{5}i.$ to $\bar{5}iv.$; dogs, grs. v. to grs. xv.

ACTIONS AND USES OF IPECACUANHA.

Externally, ipecacuanha acts as an irritant to the skin and exposed mucous membranes.

Internally, it possesses expectorant, diaphoretic, and cholagogue actions, and is also a gastro-intestinal stimulant. In the dog a full dose acts as an emetic. Whether the emetic action depends wholly on the irritating effect of the drug on the gastric mucous membrane, or on a specific action on the vomiting centre in the medulla, is a point that is not yet finally settled. The emetic action is slow, and emesis may not be produced for twenty or thirty minutes. Ipecacuanha increases the secretion from the bronchial mucous membrane, and renders it more fluid, thus acting as an expectorant. The diaphoretic action of the drug is not observed in animals.

Emetine is not used in practical therapeutics. It is said to be a gastro-intestinal stimulant, and has been prescribed in cases of gastric impaction in cattle. Experimental evidence

shows that it is an irritant poison, producing gastro-enteritis and collapse.

The chief uses of ipecacuanha in veterinary practice are in the treatment of dysentery and of bronchitis. While the exact manner in which the drug exerts beneficial effects in cases of dysentery is not known, there can be no question as to its value. It should be prescribed in large doses in this affection, and is combined with other agents (see p. 473). As full doses tend to cause vomiting in the dog, it is advisable to combine small amounts of opium with the ipecacuanha in cases of dysentery in this animal.

As an expectorant, it is prescribed in cases of acute and chronic bronchitis when the bronchial secretion is thick and scanty, and it may be combined with the syrup of squills for such cases in the dog. It is not a reliable emetic for cases of poisoning in the dog, but its emetic action is useful in acute bronchial affections when the upper air-passages become blocked by the secretion, as the act of vomition removes the obstruction.

The compound ipecacuanha powder is prescribed in the early stages of catarrhal affections in the dog, and is also useful in cases of dysentery in this animal and in the intestinal form of distemper.

Buchu.

Buchu folia—Buchu leaves.

The dried leaves of *Barosma betulina*.

Infusum buchu—Infusion of buchu.

Buchu leaves, 1; boiling distilled water, 20 (1 in 20).

DOSES.—Horses, ʒviii. to ʒx.; dogs, ʒss. to ʒii.

Tinctura buchu—Tincture of buchu.

Buchu leaves, 1; alcohol, to yield 5 (1 in 5).

DOSES.—Horses, ʒi. to ʒii.; dogs, ʒss. to ʒi.

ACTIONS AND USES.—Buchu is a mild tonic and diuretic. It exerts astringent effects on the mucous membrane of the bladder and urino-genital passages, and renders the urine antiseptic to a slight degree. It is prescribed in cases of

cystitis, also in irritation of the bladder and urethra. It is usually combined with an alkali such as the bicarbonate of potassium and with hyoscyamus, the vehicle being linseed-tea or barley-water. The infusion is too bulky for use in equine practice, so the tincture is prescribed instead.

Pareira, **Uva ursi**, and **Collinsonia** are agents possessing similar actions to buchu.

CHAPTER XX

THE VEGETABLE KINGDOM (*continued*)

Cinchona and Quinine.

Cinchonæ cortex—Cinchona bark.

The dried bark of *Cinchona calisaya*, and other species of cinchona.

Cinchonæ rubræ cortex—Red cinchona bark.

The dried bark of the stem and branches of cultivated plants of *Cinchona succirubra*.

DOSES OF POWDERED CINCHONA BARK.—Horses, $\bar{\text{ʒ}}\text{ii.}$ to $\bar{\text{ʒ}}\text{ss.}$; cattle, $\bar{\text{ʒ}}\text{i.}$; dogs, grs. v. to grs. xxx.

Tinctura cinchonæ—Tincture of cinchona.

One part of dried cinchona bark in 5 parts of alcohol.

DOSES.—Horses, $\bar{\text{ʒ}}\text{i.}$ to $\bar{\text{ʒ}}\text{ii.}$; dogs, $\bar{\text{ʒ}}\text{ss.}$ to $\bar{\text{ʒ}}\text{i.}$

Tinctura cinchonæ composita—Compound tincture of cinchona.

Tincture of cinchona, 20 ounces; dried bitter orange-peel, 2 ounces; serpentary root, 1 ounce; cochineal, 56 grains; saffron, 110 grains; alcohol, q.s. to yield 40 ounces. Twenty-two minims contain $\frac{1}{10}$ grain of alkaloids.

DOSES.—Similar to those of the ordinary tincture.

Cinchona contains a number of alkaloids, but in veterinary practice the most important of these is quina or quinine, and this is prescribed in the form of quinine sulphate.

Quininæ sulphas—Quinine sulphate.

The sulphate of an alkaloid obtained from the bark of various species of Cinchona.

Sixty grains require 60 minims of diluted sulphuric acid for solution in 2 ounces of distilled water.

INCOMPATIBLES.—All alkalies and their carbonates, benzoates, iodides, and salicylates. All infusions containing tannin throw down a quinine tannate.

DOSES.—As a bitter tonic, horses, $\bar{5}$ ss. to $\bar{5}$ i.; cattle, $\bar{5}$ i. to $\bar{5}$ ii.; dogs, grs. ss. to grs. ii. As an antipyretic, horses, $\bar{5}$ i. to $\bar{5}$ ii.; dogs, grs. ii. to grs. v.

Tinctura quininæ ammoniata—Ammoniated tincture of quinine.

Quinine sulphate, 175 grains; solution of ammonia, 2 ounces; alcohol, 18 ounces (about 1 grain of quinine sulphate in 55 minims).

This preparation, when mixed with water, should be combined with mucilage of acacia, in order to suspend the quinine, as otherwise the latter becomes precipitated and the particles adhere to the sides of the vessel.

DOSES.—For dogs, \mathfrak{M} xx. to $\bar{5}$ ss.

ACTIONS OF CINCHONA AND QUININE.

Externally, quinine possesses antiseptic and disinfectant actions.

Internally, in small doses it acts as a bitter tonic, improving appetite and digestion.

It is quickly absorbed, and is excreted chiefly by the kidneys, about one-half being removed from the system within six hours, and the remainder more slowly.

In medicinal doses, quinine exerts antiseptic and antipyretic actions. Almost all forms of protoplasm have their general nutrition modified by the drug, the effect consisting of a temporary augmentation of activity. It has a paralysing action on ciliated organisms, and it has a similar effect on the microbes of putrefaction, though to a less extent.

Quinine, if added to blood drawn from the body, lessens its oxidising power, and is said to hinder the action of the oxidising ferment. The ferment which produces coagulation of the blood is also rendered less active.

Quinine renders the movement of the leucocytes in the bloodvessels less distinct, and causes them to assume a spherical form, and there is less tendency for them to escape

from the vessels. It is doubtful, however, if the drug has this effect when administered in therapeutic doses.

It is now generally admitted that the number of leucocytes is diminished as the result of the internal administration of the drug, but the manner in which this action is brought about is not yet explained.

Quinine exerts important effects on metabolism. It causes a marked diminution in the destruction of the nitrogenous constituents of the tissues, and the amount of urea and uric acid in the urine is lessened. It would thus appear that the metabolism of proteid tissues in general is retarded by quinine.

No marked alteration in the amount of the oxygen absorbed by the lungs, or of the carbonic oxide exhaled, has been observed by investigators on the subject, and oxidation in the body is not influenced by the administration of the drug, such as was believed at one time. The action of quinine on the temperature of the body is of importance. It has little effect on the normal temperature, but in febrile conditions it exerts a marked antipyretic action.

The exact manner in which quinine reduces abnormal temperature is not clearly established. Various explanations have been offered, some authorities believing that the antipyretic action of the drug depends on its power of retarding metabolism.

As the nitrogenous decomposition is increased in febrile conditions, the action of quinine is antagonistic to this alteration in metabolism. Some consider that the micro-organisms on which the fever depends may be rendered less active by the drug, but many of these have been found to offer great resistance to it.

Its beneficial action in cases of malarial fevers is explained by the paralysing effect that the drug exerts on the *Plasmodium malaricæ*, the organism which is the cause of malaria.

Some doubt exists with reference to the antiseptic action of quinine in the blood. It has been advised in cases of septicæmia, but experimental evidence shows that the microbes of septic fever are far more resistant to the action of the drug outside the body than are the malarial parasites.

Even in very large doses quinine does not exert toxic effects in the horse.

Derangements of the sense of hearing and of sight, which sometimes occur in man as the result of full doses of the drug, are not observed in animals, nor have we noticed any idiosyncrasies in connection with its use in our patients.

In the dog, large doses cause gastro-intestinal irritation, vomiting, cardiac depression, and lowering of the blood-pressure.

On the uterus the action of quinine is doubtful, some observers stating that it excites uterine contractions, while others deny that it has this effect. Experience of its employment in pregnant animals leads us to the conclusion that it does not exert any ecboic action.

MEDICINAL USES.—*As a bitter tonic*, quinine is prescribed in cases of atonic indigestion, and may be combined with nux vomica and a vegetable bitter. In convalescence from debilitating diseases, it is prescribed in combination with a non-irritating preparation of iron. For the above purposes small doses of the drug should be employed.

In cases of canine distemper, quinine is one of the most reliable therapeutic agents, the antiseptic and antipyretic actions of the drug probably accounting for the results obtained.

As an antipyretic, quinine is largely employed in febrile affections. Its effects are more prolonged, and there is far less risk of depression or collapse than is the case with the newer antipyretic agents. It is given either in the form of bolus or of mixture, the addition of a little dilute sulphuric acid being necessary to render it soluble when prescribed in solution. The doses employed and the frequency of administration will depend on the degree of pyrexia present. Usually moderate doses repeated at intervals give the best results.

In the treatment of red-water in cattle the administration of quinine in doses of from 2 to 4 drachms three times daily sometimes gives good results; but many practitioners have found it of little or no value in this affection (see p. 538).

Quinine has been found useful in cases of malarial and other fevers affecting horses and cattle in India.

The ammoniated tincture of quinine is found useful in canine practice, in cases where a stimulant such as ammonia is indicated along with the quinine.

Cinchona bark contains a quantity of tannin, and hence possesses astringent actions in addition to those mentioned. It is prescribed as a tonic in cases where an astringent effect is desirable, and is combined with other tonic agents.

The tincture of cinchona and the compound tincture are useful tonics in canine practice.

Salicylic Acid.

Acidum salicylicum—Salicylic acid.

This is principally prepared by the action of carbonic anhydride on phenol, and is known in commerce as *artificial salicylic acid*.

Natural salicylic acid is derived from oil of wintergreen or from oil of sweet birch and other sources.

For internal use in canine practice the natural acid is preferred, as it is free from cresotic acids.

The natural acid is, however, too expensive for equine practice.

DOSES.—Horses and cattle, $\bar{\text{v}}\text{ii.}$ to $\bar{\text{v}}\text{iv.}$; sheep, $\bar{\text{v}}\text{ss.}$ to $\bar{\text{v}}\text{i.}$; dogs, grs. v. to grs. xv.

INCOMPATIBLES.—Spirit of nitrous ether; iron salts.

Sodii salicylas—Sodium salicylate.

This may be prepared either with the natural or the artificial salicylic acid. It contains 86 per cent. of salicylic acid.

DOSES.—Horses, $\bar{\text{v}}\text{ii.}$ to $\bar{\text{v}}\text{i.}$; dogs, grs. x. to $\bar{\text{v}}\text{ss.}$

Salicinum—Salicin—is a glucoside obtained from the bark and leaves of various species of willow (*Salix fragilis*, *S. purpurea*, *S. alba*); also from *Populus tremula* and other species of *Populus*.

DOSES.—Horses, $\bar{\text{v}}\text{i.}$ to $\bar{\text{v}}\text{iii.}$; dogs, grs. v. to grs. xv.

Aspirin—Salicyl-acetic acid.

This is used as a substitute for salicylic acid and its salts. It is said not to cause gastric irritation.

DOSES.—Horses, $\bar{\text{v}}\text{ii.}$ to $\bar{\text{v}}\text{iii.}$; dogs, grs. v. to grs. x.

INCOMPATIBLES.—Sodium bicarbonate and all alkalies.

ACTIONS OF SALICYLIC ACID AND ITS PREPARATIONS.

Externally, salicylic acid possesses antiseptic actions, and is said to be equal to carbolic acid in this respect. The salicylates also exert antiseptic actions, but are less irritant to the skin and mucous membranes than the free acid. Both the latter and the salicylates retard or prevent the putrefaction of proteid solutions and the alcoholic and acetic acid fermentations.

Salicylic acid is a local irritant, and if applied for some time in the form of powder to wounds, mucous surfaces, or even the skin, may induce corrosion similar to that caused by carbolic acid. Solutions of the drug do not possess caustic properties.

In the horse even large doses do not produce any appreciable effects beyond temporary dyspepsia.

In the dog the toxic symptoms observed are vomiting, dyspnœa, weakness of the hind-quarters, and convulsions, succeeded by paralysis.

Some authorities state that the drug possesses a slight cholagogue action, and that it has a specific action on the liver cells. It is also said to have a direct action on the renal epithelium, causing increased formation of urea and slight diuresis.

Salicylic acid has no effect on the temperature of healthy animals, but in febrile cases it causes a marked fall of temperature. It is rapidly absorbed from the stomach and intestines, and circulates in the blood in the form of salicylates of the alkalies. It is excreted by the kidneys, chiefly in combination with glyocol, salicyluric acid being produced, which is analogous to hippuric acid. It is said to act as a stimulant and disinfectant to the urinary passages.

MEDICINAL USES.—The chief use of salicylic acid internally is in the treatment of acute rheumatism. The salicylate of soda is usually employed, as it is less likely to cause gastric irritation.

The beneficial effects of the drug are not always observed in veterinary practice. This may be due to insufficient doses being prescribed.

The manner in which salicylic acid acts in cases of rheumatism is not yet definitely known. Hence it is termed a specific in this affection. It is of little or no value in chronic cases.

Salicylate of soda proves useful in the early stages of pachymeningitis in the dog; it allays the pain and nervous irritability that are present in this affection (see p. 566).

As an antipyretic, salicylic acid is now seldom employed, other agents, especially quinine, being far more reliable. It is recommended by Continental authorities in the treatment of cystitis, and, combined with tannic acid, it has been found useful in cases of obstinate diarrhoea in calves.

As an antiseptic, salicylic acid has not been found to possess any advantages over agents already in use for this purpose. In the form of ointment—1 part of salicylic acid to 8 parts of lanolin—it is found useful in the treatment of chronic eczema in the dog, also in the treatment of follicular mange. In the latter affection it is combined with zinc oxide, sulphur, prepared storax, and lanolin, and this ointment is found very effectual by Mr. H. Gray (see Appendix).

Salicin becomes oxidised in the body, and converted into salicylic acid. It is said not to irritate mucous membranes and not to depress cardiac action; but its effects are not so certain as those of salicylic acid.

Aspirin is highly recommended in the treatment of rheumatism in man, but it is seldom employed in veterinary practice for this purpose.

Thioform is a basic bismuth salt of dithio-salicylic acid, prepared by mixing solutions of a soluble bismuth salt with dithio-salicylate of sodium. It is employed as a surgical dressing, is non-irritating, antiseptic, non-toxic, and possesses a marked desiccative action on wounds. Its high price prohibits its general use in veterinary surgery.

Continental authorities recommend the internal use of thioform in cases of chronic catarrh of the stomach and intestines in the dog.

CHAPTER XXI

THE VEGETABLE KINGDOM (*continued*)

Olive-Oil.

Oleum olivæ—Olive-oil.

The oil expressed from the ripe fruit of *Olea Europæa*.

ACTIONS AND USES.—Olive-oil is a mild laxative and demulcent, and also possesses nutrient properties.

Externally, it is an emollient. As a laxative it is prescribed in canine practice in combination with castor-oil, and is also employed as an enema in cases of intestinal obstruction. As a demulcent, it is given in cases of irritant poisoning.

Externally, olive-oil is largely employed as a basis for liniments, and, combined with carbonate of potash and water, it forms an emulsion, which is useful as an application to blistered surfaces (see Appendix).

Soaps.

Sapo durus—Hard soap; sodium oleate—is obtained by boiling palm-oil, or cocoanut-oil, or tallow, with sodium hydroxide or sodium carbonate. The alkali unites with the fatty acids, displacing the basic glyceryl.

Sapo mollis—Soft soap; potassium oleate—is obtained by boiling whale-oil with potassium hydroxide or carbonate. The refined Pharmacopœial soaps are prepared with olive-oil or purified animal fats as a basis.

Linimentum saponis—Soap liniment.

Soft soap, 2 ounces; camphor, 1 ounce; oil of rosemary, 3 drachms; alcohol, 16 ounces; distilled water, 4 ounces.

Dissolve the soap in the water, mix with the camphor and oil of rosemary dissolved in the alcohol, and filter after a week.

Ether soap.—Dissolve 32 parts of soft soap in 20 parts of alcohol (90 per cent.). Allow them to stand for twenty-four hours, decant carefully, then add methylated ether (specific gravity, '720), 52 parts.

ACTIONS AND USES.—Soaps are employed for general cleansing purposes. Various forms of soaps, medicated or otherwise, are used in the treatment of affections of the skin, especially in those of a parasitic nature. Soaps may be medicated with various antiseptic agents, and are useful in cleansing the hands of the surgeon prior to the performance of an operation.

Fluid soaps containing ether are preferred for this purpose, and also for cleansing the site of operation.

Soap added to enemas increases their laxative action.

As an emetic for the dog, in cases of emergency, soap and water may be administered until emesis is induced.

Soap liniment is employed as a mild stimulating application, and also as a basis in the preparation of other liniments.

Glycerin.*

Glycerinum — Glycerin ; glycerol—is obtained by the interaction of alkalies or of superheated steam with fats and fixed oils.

ACTIONS AND USES.

Externally, glycerin, if applied undiluted, is slightly irritant to the skin and mucous membranes, this effect depending on its power of abstracting water from the tissues. It also possesses antiseptic properties, and when diluted it acts as a demulcent and emollient.

Internally, in moderate doses, it acts as a laxative in the dog. Large doses induce purgation, and have a peculiar effect in breaking down the red blood-corpuscles and causing hæmoglobinuria.

* For convenience of description this agent is considered here. It properly belongs to the animal kingdom.

As a solvent, glycerin is extensively employed in pharmacy, its combinations with drugs being termed 'glycerina'—example, *Glycerinum belladonnæ* (see p. 269).

Glycerin may be added to mixtures containing iron in order to conceal the nauseous taste of the latter. In the preparation of electuaries it is also employed, and it exerts beneficial local effects in cases of pharyngitis and laryngitis.

Glycerin injected into the rectum induces evacuation of fæces, and for this purpose $\frac{1}{2}$ ounce, either alone or with one-third part of water added, is employed in cases of constipation in the dog. From 4 to 8 ounces may be used for the horse, but in the latter the effect of the drug is not so reliable.

Suppositories containing glycerin have been found useful in canine practice in cases of habitual constipation. The mode of action of glycerin in this respect is believed to depend on the local irritation of the lower part of the rectum which it induces; this causes reflex peristalsis.

Externally, glycerin is employed in combination with astringents as a liniment for the treatment of mud-fever and cracked heels in the horse. For this purpose the *glycerinum plumbi subacetatis*—which is of the same strength as Goulard extract—may be used, glycerin being employed for the solvent instead of water. This can be further diluted with glycerin, and forms an excellent astringent application in such cases.

Treacle.

Theriaca—Treacle.

DOSE.—For cattle, lb. i. to lb. ii.

ACTIONS AND USES.—Treacle is demulcent, nutritive, and laxative. It is chiefly used in cattle practice, forming a valuable adjunct to saline purgatives, increasing their action and disguising their nauseous taste.

It also forms a convenient vehicle for the administration of drugs that are likely to cause irritation of the mouth and throat, such as chloral hydrate or ammonia preparations.

Treacle is employed in pharmacy as an excipient.

Tragacanth.

Tragacantha—Tragacanth.

A gummy exudation obtained from the stem of *Astragalus gummifer*.

Mucilago tragacanthæ—Mucilage of tragacanth.

Prepared with tragacanth in powder, alcohol, and distilled water.

Pulvis tragacanthæ compositus—Compound powder of tragacanth.

Tragacanth, 1; gum acacia, 1; starch, 1; refined sugar, 3.

ACTIONS AND USES.—Tragacanth possesses demulcent actions. Its chief use is for the suspension of heavy insoluble powders such as bismuth salts in mixtures, also to prevent drugs possessing irritating properties from injuring the mouth, tongue, and throat. Either the mucilage or the compound powder may be employed for these purposes.

Gum Acacia.

Acaciæ gummi—Gum acacia.

Obtained from the stem and branches of *Acacia senegal* and other species.

ACTIONS AND USES.—Gum acacia, in the form of mucilage, has similar actions and uses to those of tragacanth, already mentioned.

It is also employed in pharmacy in the preparation of emulsions, such as those containing oils or resinous tinctures.

Dextrin or British gum may be employed instead of gum acacia for veterinary purposes, as it is far cheaper.

Liquorice-root.

Glycyrrhizæ radix—Liquorice-root.

The root of *Glycyrrhiza glabra* and other species.

ACTIONS AND USES.—Liquorice-root possesses demulcent and expectorant actions. It is chiefly used as a basis in preparing electuaries.

Compound liquorice - powder contains senna, sulphur, liquorice, fennel, and sugar. It is occasionally employed as

a laxative for the dog in cases of habitual constipation, and may be administered in doses of a drachm, mixed in the food.

Linseed.

Linum—Linseed ; flax seed.

The dried ripe seeds of *Linum usitatissimum*.

Linum contusum—Crushed linseed.

Lini farina—Linseed meal.

Linseed reduced to powder.

Oleum lini—(See p. 348).

Linseed is demulcent and nutritive. In the form of linseed-tea or boiled linseed it is a valuable nutrient for sick horses or cattle, and is also indicated in irritable conditions of the throat, alimentary canal, kidneys, or bladder.

Linseed-tea is prepared by infusing linseed in 15 or 20 parts of boiling water for two hours.

Linseed and linseed cakes are largely employed as feeding-stuffs for cattle.

Externally, linseed is extensively employed in the form of poultices (see p. 87).

The ordinary linseed poultice is prepared with 4 parts of linseed meal and 10 parts of boiling water, the former being mixed gradually with the latter and stirred constantly. The vessel should first be heated by pouring boiling water therein.

Pearl Barley.

Hordeum decorticatum—Pearl barley.

Decoctum hordei—Barley-water.

One part of barley boiled in 15 parts of water for twenty minutes and then strained.

Barley-water is both nutrient and demulcent ; it is a useful adjunct in the treatment of irritable conditions of the bladder and urinary passages, the animal being permitted to drink it *ad libitum*.

In the rearing of foals, when it is found necessary to substitute cow's milk for that of the dam, the addition of barley-water assists digestion.

Wheaten Flour.

Farina tritici—Wheaten flour.

The grain of wheat (*Triticum sativum*) ground and sifted.

Wheaten flour is used medicinally in the treatment of diarrhœa and superpurgation, being administered in the form of flour gruel along with suitable astringents.

Starch.

Amylum—Starch.

This is obtained from wheat, maize, and rice. It possesses demulcent and emollient actions, and in the form of starch mucilage or gruel it is administered in cases of diarrhœa, dysentery, etc.

It is an efficient antidote in cases of iodine poisoning.

Externally, starch is protective, absorbent, and desiccant, and forms a good basis for surgical dusting-powders.

It is also employed in the form of starch paste to stiffen bandages for surgical purposes.

Marsh Mallow Root.

Althææ radix—Marsh mallow root.

The root of *Althæa officinalis*.

ACTIONS AND USES.—Marsh mallow root contains a large amount of mucilage, and possesses demulcent actions. In the form of marsh mallow ointment it is a popular application in the treatment of mammitis or garget in cows.

Chaulmugra-oil.

Gynocardia oleum—Chaulmugra-oil.

A semi-solid oil obtained from the seeds of *Gynocardia odorata*.

ACTIONS AND USES.—Chaulmugra-oil has been employed in human medicine as an external application in cases of psoriasis, obstinate eczema, and other skin diseases; also internally in cases of leprosy.

We have no evidence of its value in veterinary practice.

CHAPTER XXII

THE ANIMAL KINGDOM

Lanolin.

Adeps lanæ—Wool fat ; anhydrous lanolin.

The purified fat of sheep's wool, consisting chiefly of cholesterin.

Adeps lanæ hydrosus—Lanolin ; hydrous wool fat.

Three parts of distilled water incorporated with 7 parts of wool fat by rubbing together in a warm vessel.

ACTIONS AND USES.—Lanolin is an emollient, and is chiefly used as a basis for ointments. It possesses certain advantages in this respect over other agents : it does not become rancid, and water can be incorporated with it without affecting its consistency.

As lanolin originates from keratinous tissues, it possesses an affinity for the skin and is readily absorbed therefrom. Hence, when used as a basis for agents such as iodine, absorption by the skin is assisted.

As a basis for blisters, it proves far superior to either lard or vaseline, as the activity of the counter-irritant is largely increased ; and in the treatment of skin affections it assists the action of the agents employed.

It is advisable to combine a small amount of soft paraffin or vaseline with the lanolin in order to render the latter less tenacious and easier to apply to the skin.

Lanolin is one of the best dressings for weak and brittle feet in the horse ; for this purpose a cheaper form is employed.

Lard.

Adeps præparatus—Prepared lard.

The purified fat of the hog (*Sus scrofa*).

Adeps benzoatus—Benzoin, 1; prepared lard, 50.

ACTIONS AND USES.—Lard is a simple emollient. It is frequently employed as a basis for ointments, but agents such as vaseline and lanolin have now replaced it to a great extent.

Benzoated lard is preferred to the ordinary form, as it is less liable to become rancid by keeping.

Spermaceti.

Cetaceum—Spermaceti.

A fatty substance obtained from the head of the sperm-whale.

Spermaceti is emollient and demulcent; it is sometimes employed as an application to blistered surfaces and irritable conditions of the skin.

Gelatine.

Gelatinum—Gelatine—is obtained from animal tissues, such as skin, tendons, ligaments, and bones. Its chief use is in connection with pharmacy, where it is employed for coating boluses and pills, rendering them easy to administer and preserving the ingredients; it is also used to prepare capsules for the convenient administration of drugs in the dry form.

Keratine.

Keratine is prepared from horn shavings. Being insoluble in the gastric juice, but soluble in the intestines, it is employed to coat boluses or pills which are intended to act on the intestinal canal, but not on the stomach. Thus certain anthelmintics which tend to cause gastric irritation may be coated in this manner. Also drugs, such as intestinal antiseptics, tannic acid, lead acetate, etc., when their local action is desirable on the intestinal canal.

Cod-Liver-Oil.

Oleum morrhuæ—Cod-liver-oil.

The oil obtained from the liver of the cod-fish (*Gadus morrhua*).

ACTIONS AND USES. Cod-liver-oil possesses nutrient, tonic and alterative actions. Administered in small repeated doses it acts as a food, increases weight and strength, and improves the general condition of the system.

Some authorities state that cod-liver-oil does not possess any action apart from that of an easily-digested food. It would appear, however, that it is more easily digested than ordinary animal fats. Large quantities induce nausea and diarrhœa.

In consequence of the present high price of cod-liver-oil, it is not often prescribed for horses or cattle. For these animals the usual doses required are from 2 to 4 ounces, repeated twice daily.

In canine practice it is prescribed in cases of malnutrition and during convalescence from debilitating diseases. It may be combined with preparations of malt, or employed in the form of an emulsion. Many convenient forms of the latter, in combination with hypophosphites, are now prepared by chemists.

The usual dose of cod-liver-oil for the dog is from 1 to 2 drachms, repeated twice daily, care being taken to reduce the amount should the agent disagree with the animal.

Honey.

Mel—Honey.

A secretion deposited in the honeycomb by the hive bee (*Apis mellifica*).

Honey is demulcent, laxative, and nutritive. In pharyngeal affections it increases the secretions of the mouth and throat, relieves dryness of the latter and lessens difficulty in swallowing. It is chiefly employed as a constituent of electuaries in the treatment of pharyngitis, laryngitis, glossitis, etc.; also in the form of mouth-washes, combined with boric

acid or potassium chlorate, in irritable conditions of the mouth and tongue.

Beeswax.

Cera flava—Yellow beeswax.

Cera alba—White beeswax.

The chief use of beeswax is to increase the consistence of ointments and plasters. It forms a useful constituent of the various forms of dressings for the feet of horses (see p. 325).

Unguentum simplex, which is frequently employed as a basis for ointments, is composed of 1 part of yellow wax combined with 4 parts of prepared lard.

The British Pharmacopœia formula (1885) was composed of white wax, 2; benzoated lard, 3; almond-oil, 3.

Pepsin.

Pepsinum—Pepsin—is obtained from the mucous lining of the fresh stomach of the pig, sheep, or calf.

ACTIONS AND USES. Pepsin converts proteids into peptones, but has no effect on fats or starch. Hence it only proves of service in young herbivorous animals during their period of existence on a milk diet, but is useful in the treatment of dogs of all ages.

The theory on which the therapeutical value of pepsin is based is that under certain conditions sufficient of the pepsin ferment is not secreted by the stomach. This is open to doubt, as it has been proved that in most cases it is the acid secretion that is deficient, the ferment being usually present in sufficient amount. Nevertheless, pepsin, combined with bismuth and other agents, is frequently prescribed in cases of dyspepsia, and proves useful.

As pepsin digests only in acid solution, it should not be combined with alkaline carbonates or bicarbonates.

CHAPTER XXIII

THE ANIMAL KINGDOM (*continued*)

Cantharides.

Cantharis—Cantharides.

The dried Spanish or blistering fly, *Cantharis vesicatoria*, also known as *Lytta vesicatoria*. The active principle is cantharidin.

Tinctura cantharidis—Tincture of cantharides.

One part of cantharides with 80 parts of alcohol (1 in 80).

DOSES.—Horses, ℥ lxxx. to ʒii. ; dogs, ℥ v. to ℥ x.

Unguentum cantharidis—Cantharides ointment.

Cantharides, 2 ; olive-oil, 2 ; lard, 2. Heat ten hours in steam-bath ; add yellow wax, 1 ; turpentine (oleo-resin), 2.

N.B.—In preparing ointments of cantharides, they should not be heated beyond 200° F., as the active principle becomes volatile.

ACTIONS.—Applied to the skin, cantharides acts as a vesicant, causing smarting, pain, and the formation of vesicles, which tend to coalesce. The vesication produced is less painful than that caused by strong applications of mustard, as the irritant does not penetrate to the deeper tissues, such as occurs with the volatile oil of mustard. When applied in the form of a properly prepared ointment, vesication is produced in a period of time varying from three to twelve hours. The vesicles are of large size, and, after a variable time, they burst and discharge a yellow serous fluid, which dries and forms a scaly covering to the part.

If the blistering ointment be used too strong or too freely,

inflammation of the deeper layers of the skin may occur, with suppuration, and in some cases sloughing; the hair bulbs become injured, and a permanent blemish results. If applied to a large surface of skin, absorption of cantharidin may result, and produce the constitutional symptoms to be presently described.

Internally, cantharides acts as an irritant to the alimentary tract, toxic doses producing gastro-enteritis, nephritis, strangury, and hæmaturia. If administered in solution, the mucous membrane of the mouth and throat becomes blistered, and the pain and swelling of the œsophagus may interfere with deglutition.

Irritation of the stomach also occurs, evidenced by vomiting in the dog; purging, abdominal pain, shock and collapse, are other symptoms observed. The drug is absorbed from the alimentary canal, and to a less extent from the skin. It exerts a special irritating effect on the organs by which it is eliminated from the system—viz., the kidneys and the genito-urinary tract.

Acute nephritis occurs, with albuminuria, the urine being scanty and containing blood, or total suppression of urine may be present; there is also vesical irritation, frequent attempts at micturition, and evidences of aphrodisiac effects, such as the occurrence of frequent erections of the penis. The pulse becomes rapid and feeble, the respirations laboured, while the presence of convulsions and coma point to a specific action on the nervous system.

ANTIDOTES.—In cases where absorption of the drug has occurred from the application of a blister to the skin, the blistered part should be washed with warm water containing an alkali such as bicarbonate of soda, and an emulsion consisting of carbonate of potash, olive-oil, and water applied.

Oil alone should not be used, as it tends to render the cantharidin more soluble and more easily absorbed.

Internally, mucilaginous drinks and demulcents should be freely given, and, if pain be present, an opiate combined with bicarbonate of soda is indicated.

On no account should oil or fatty matters be administered as

antidotes to cantharides, as they render the cantharidin more soluble, and thus facilitate absorption of the agent.

MEDICINAL USES.—The chief use of cantharides in veterinary practice is as a vesicant. When prepared of proper strength and carefully applied, the ointment of cantharides forms a safe and effectual agent for the production of counter-irritation. The usual strength employed is 1 part of cantharides to 5 or 8 parts of lard or lanolin.

When active counter-irritation is desirable, such as in the treatment of joint affections in the horse, equal parts of the unguentum cantharidis and the unguentum hyd. biniodidi are combined.

Cantharides was formerly recommended in small doses internally, combined with mineral tonics, in the treatment of nasal gleet in the horse, but the beneficial effects were more imaginary than real. Similar remarks will apply to its supposed therapeutical value in cases of chronic cystitis and incontinence of urine. Other agents are far safer and more likely to prove of service.

Cantharides is not a safe counter-irritant for the dog, as it is liable to produce great irritation, and to become absorbed not only from the skin, but also by the animal licking the blistered part.

In the application of blistering agents to the skin of the horse, it is necessary to observe certain precautions in order to avoid unfavourable results.

1. Cantharides should not be employed as a counter-irritant in cases of renal affections, nor in irritable conditions of the bladder or urinary passages, nor in cases of debility and weakness.

2. Counter-irritants of all kinds should be avoided when a part is in an inflamed or irritable condition. The existing inflammation should first be reduced by appropriate means before a blister is applied.

3. After the application of a blister the horse's head should be secured, so that he cannot lick or bite the blistered part. The irritation usually passes off in from twelve to twenty hours. Ointments of cantharides are now prepared which

are said to be non-irritating, although proving active vesicants. These only contain the active principle—viz., cantharidin—and certainly prove far less irritating to the animal than the ointments prepared in the ordinary manner, while their vesicant action is greatly increased.

4. Not more than two legs of a horse should be blistered at the same time. Three weeks should elapse before the others are blistered, and between each application. If the effects of a blister are not sufficiently apparent in about thirty hours after application a little more may be applied; but great discretion is necessary in order to prevent too severe an action.

In applying blisters to parts that have been fired great care is necessary, in order to prevent sloughing of the skin and a permanent blemish as the result. After deep firing it is not advisable to blister at the same time, especially in the case of horses with fine skins.

5. In applying blisters to the limbs, avoid the flexures of joints, such as the posterior aspect of the knee, the anterior aspect of the hock, and the hollow of the heel, as fissures of the skin may occur which prove very difficult to treat. To the latter region a little vaseline should be applied, in order to prevent the blister from spreading thereto.

6. The blistered part should *not* be liberally dressed with oil or vaseline. The best application is an emulsion composed of carbonate of potash, olive-oil, and water. This prevents the skin from becoming too soft (see Appendix).

7. In hot weather severe and extensive blistering should be avoided. In some instances the application of cantharides produces marked swelling of the limbs, with a tendency to suppuration and sloughing of the skin, and the appearance of swellings involving the sheath and inferior surface of the abdomen.

These are exceptional cases, and may occur in spite of all precautions; they generally depend on an unhealthy condition of the system. In such instances the blister should be washed off, and cooling astringent lotions applied, such as

the diluted liquor plumbi subacetatis, and after the pain subsides gentle exercise may be given.

If the swellings on the sheath and abdomen are extensive, they may be punctured, so as to permit the contained fluid to escape.

In some animals with a nervous temperament the application of a blister may induce constitutional disturbance and a mild degree of irritative fever. Sedative treatment, both internally and locally, may be required.

Finally, it may be mentioned that if the blistered part be within reach of the tail, the latter should be secured, so as to prevent portions of the blister from being carried to surrounding parts by this organ.

Mylabris phalerata—also known as the Chinese blistering fly or beetle—is occasionally employed instead of cantharides. Mr. H. Gray prefers it to cantharides for producing vesication in well-bred horses, and finds that it causes less irritation. It is said to contain more than double the amount of cantharidin that is present in Spanish fly.

Weak preparations of cantharides occasionally prove useful in promoting the growth of hair, and probably act by stimulating the hair-roots.

CHAPTER XXIV

THE ANIMAL KINGDOM (*continued*)

Adrenalin.

Adrenalin, a white micro-crystalline powder, is obtained from the suprarenal glands of the ox or sheep. In the form of adrenalin chloride it is more soluble, and a solution of this salt is usually employed for medical and surgical purposes.

Adrenalin chloride solution contains 1 part of adrenalin chloride and 5 parts of chloretone in 1,000 parts of normal saline solution. This may be further diluted with normal saline solution, as required.

DOSE.—For the dog, 5 to 30 minims.

ACTIONS AND USES.—A substance named epinephrin is regarded by some authorities as the active principle of the suprarenal glands; but adrenalin, which was first prepared by Dr. Takamine, appears to be a slightly modified form of the above.

Applied to the unbroken skin, solutions of adrenalin have little or no action, but denuded surfaces or mucous membranes become pale and anæmic. This effect depends on a special action of the drug, *i.e.*, it causes constriction of the arterioles and capillaries, and thus renders the part bloodless. A similar effect is produced when the agent is injected hypodermically.

A solution containing 1 in 10,000 blanches the conjunctiva.

The chief action of adrenalin internally is to cause a rapid rise in the blood-pressure and to render the heart's action slower and stronger. It is doubtful whether any action in

this respect occurs when the agent is administered by the mouth, or even injected hypodermically; but when injected intravenously, even small amounts exert a marked alteration in the blood-pressure.

The action of the drug on the heart resembles that of digitalis to a certain extent. The slow pulse is due to stimulation of the vagus in the medulla, while the effect of the drug on the heart-muscle is to strengthen the systole. The diastole may be at the same time rendered less complete. The rise in blood-pressure depends chiefly on a marked contraction of the peripheral arterioles, due to a direct action on the muscular coats of the vessels. It also depends, but to a less extent, on the increased efficiency of the cardiac contractions, and, according to some authorities, the vasomotor centre is stimulated by the drug. The rise of blood-pressure, although rapid and marked, passes off quickly, and, as previously stated, a small amount injected intravenously produces this action. The absence of this effect when the drug is given by the mouth or hypodermically is accounted for by the instability of the agent, and the probability that it becomes oxidised in the tissues and is rendered inert.

The action of adrenalin on certain vessels is remarkable.

The *pulmonary vessels* are not constricted, or only to a slight degree, and it is said that even the local application of the drug to the lung-tissue does not produce pallor of the part.

The *cerebral vessels* also are not constricted, and some authorities believe that, as they have observed a widening of the retinal vessels as the result of the action of the drug, the cerebral vessels may be dilated.

This may depend on the constriction of the vessels in other regions of the body, by which more blood is diverted to the cerebrum. It is also stated by those who have investigated the actions of adrenalin that the vessels of the muscles are scarcely altered in calibre, while those of the skin are contracted.

The vessels of the stomach and intestines are also constricted, and this, no doubt, contributes to the rise in general

blood-pressure. Experiments have demonstrated that a solution of adrenalin applied to the exposed mesentery will cause constriction of the vessels, or may temporarily obliterate them.

The uterine vessels also become constricted, while those of the bladder are less affected. The drug causes spasmodic contraction of unstriated muscle in other localities.

The muscular fibres of the eye that are supplied by the superior cervical ganglion become contracted when a solution of adrenalin is applied locally or injected intravenously, the result being dilatation of the pupil, retraction of the *membrana nictitans*, and protrusion of the eyeball. This depends on a direct action on the muscular fibres, and not on the nerve terminations.

On some involuntary muscles the opposite effect is produced: thus, the cardiac sphincter of the stomach and the internal anal sphincter become relaxed, and the movements of the stomach, intestines, and bladder become retarded, or after large doses arrested.

The uterus and vagina in the female, and the vas deferens, vesiculæ seminales, and external genital organs in the male, become contracted and anæmic.

On the salivary glands and the mucous glands of the mouth and throat the effect of the drug is to cause increased secretion by stimulation of the nerve terminations, as in the case of pilocarpine.

The lachrymal secretion and the bile are also increased, while the secretions of the sweat-glands and pancreas are unchanged. Large doses have been found to cause glycosuria, probably by altering the activity of the liver and pancreas.

The toxic effects of adrenalin, induced by hypodermic and intravenous injections of the drug, have been investigated by Continental authorities, and it is stated that large amounts are required to produce fatal results.

The symptoms observed were excitement, followed by muscular tremors in some cases, and by vomiting in dogs. These were succeeded by paralysis of the hind extremities, rapid breathing, dyspnœa, and failure of respiration. In

some cases the urine is increased in amount, and hæmorrhages occur from the kidneys and mucous membranes.

The chief use of adrenalin in veterinary practice is as a local hæmostatic for surgical purposes. When injected hypodermically in a suitable amount it causes anæmia of the part, and as it is rapidly oxidised it produces only local effects. It thus renders minor operations practically bloodless, and is usually combined with a local anæsthetic, such as cocaine or eucaine. It increases the action of these agents, as it tends to prevent their entry into the general circulation by constricting the arterioles of the part; thus their effect is localised (see p. 266).

A combination of eucaine and adrenalin for surgical purposes is prepared by Messrs. Parke, Davis and Co., London, and is named 'endrenine.' Each cubic centimetre contains $\frac{1}{8}$ grain of β -eucaine hydrochloride and $\frac{1}{20000}$ grain of adrenalin chloride. This can be further diluted, but for veterinary purposes any solution of less strength than the above will not give satisfactory results. For minor operations this solution is safe, and is especially useful in canine surgery (see p. 266).

In the removal of tumours, from 15 to 20 minims may be injected around the base at different points, also into the substance of the growth, and a period of time of about ten minutes allowed before the operation is commenced.

It must be distinctly understood, however, that adrenalin will only check hæmorrhage from vessels of small size. Still, by rendering the tissues anæmic, it facilitates the securing of larger vessels before they are severed.

As adrenalin readily becomes oxidised and thus inert, it is necessary to protect it from the action of the air and to use fresh solutions. When exposed to the air, solutions become of a pink colour.

In post-partum hæmorrhage the drug should be injected into the uterus; in such a case it not only causes contraction of the uterine vessels, but also arrests hæmorrhage by producing a tonic contraction of the muscular walls of the organ itself.

It has also been found useful in checking epistaxis, a 10 per cent. solution being sprayed into the nasal cavities. Wherever possible, the solution of adrenalin should be applied directly to the surface or organ from which the hæmorrhage proceeds, as the desired effects will not be produced by intravenous injection, the local contraction of the vessels being more marked and lasting longer when a direct application is made.

In congestion of the conjunctiva, the application of a solution of 1 in 10,000 of adrenalin promptly relieves the condition, and in the treatment of conjunctivitis the employment of the drug gives good results. It has also proved of service in other acute inflammatory conditions of the eye.

According to Dr. Zehyl, veterinary surgeon, Treblin, Germany, a solution of adrenalin (1 to 10,000) injected subcutaneously acts as a local anæsthetic, the effects lasting from four to six hours, and for diagnostic purposes in cases of lameness he injects from 80 to 120 minims at the inside and outside of the fetlock, and finds that it proves as effectual as cocaine.

He has also found the drug of value in certain affections, such as red-water in cattle and azoturia in horses, and as a local injection both inside and outside the fetlock in cases of laminitis.

A solution of the drug of 1 to 10,000 is recommended as a hypodermic injection in the former affections, the doses varying from $5\frac{1}{2}$ to 8 fluid drachms, to be repeated several times daily. Further clinical evidence is necessary in order to ascertain the therapeutical value of the drug in this direction.

For the dog, the dose of adrenalin solution (1 to 1,000) by the mouth is from 5 to 30 minims; if administered hypodermically, less than half these doses will suffice.

Adrenalin solution has been tried in cases of surgical shock occurring during chloroform anæsthesia, but the action of the drug in raising the general blood-pressure has been shown to be of such short duration that it is not of great practical value in overcoming the condition.

Experiments on animals poisoned with chloral or chloroform show that the drug has a marked effect in restoring the circulation when it is failing.

In cases of surgical shock solutions of 1 to 20,000 are combined with normal saline solution and injected intravenously ; but to be of any value they must be frequently repeated.

Mallein.

Mallein is employed for the diagnosis of glanders, and is the sterilised and filtered liquid culture of glanders bacilli. It has proved a most reliable agent for this purpose, but requires to be carefully used, according to the following directions :

DIRECTIONS FOR USING MALLEIN, AS PREPARED AND SUPPLIED BY THE ROYAL VETERINARY COLLEGE, LONDON.

1. While under the mallein test horses ought to be left at rest in the stable and protected from draughts. The rectal temperature ought to be taken once or twice on the day before the test is applied.

2. The dose of mallein for a horse is 1 cubic centimetre, or 18 minims. It ought to be injected about the middle of the side of the neck, with a clean hypodermic syringe. The best form of syringe is one with an asbestos piston, as the whole instrument may then be sterilised by boiling it in water for five minutes before use.

3. The mallein must be injected into the subcutaneous connective tissue, and care must be taken that the whole dose is actually introduced.

4. The temperature must be taken at the time of injection, and at the ninth, twelfth, and fifteenth hours afterwards

5. Provided the temperature was normal (under 101° F.) before the injection, it will rise 2° or more (103° to 105° F.) during the next fifteen hours if the horse is glandered ; but it will remain practically unaffected (under 102° F.) if the horse is not glandered.

6. Attention must also be paid to the swelling that forms at the seat of injection. When the horse is glandered this goes on increasing in size during the second twenty-four hours after the injection, and it seldom declines before the third or fourth day. The maximum diameter of this swelling in glandered horses varies from 5 to 10 inches.

7. In horses that are not glandered the local swelling attains its maximum size during the first fifteen hours, and by the twenty-fourth hour it has almost entirely disappeared. Its maximum diameter is usually about 3 or 4 inches.

8. When the temperature gradually rises from the normal to 104° F. during the first fifteen hours, and a large slowly disappearing swelling forms at the seat of injection, the horse may confidently be declared glandered.

9. If, with a normal temperature at the time of injection, a horse displays only the temperature reaction, or only the local reaction, the case must be considered doubtful, and the test repeated after the lapse of a week.

10. When the temperature is 102° F. or more at the time of injection, the temperature reaction is unreliable, but in such a case the diagnosis may be based on the characters of the local swelling.

11. The mallein should be kept in a cool place, and protected from light. Should it lose its transparency or become cloudy, it must not be used.

Tuberculin.

Tuberculin is employed in the diagnosis of tuberculosis. It is the sterilised and filtered liquid culture of tubercle bacilli.

DIRECTIONS FOR USING TUBERCULIN, AS PREPARED AND SUPPLIED BY THE ROYAL VETERINARY COLLEGE, LONDON.

1. While under the tuberculin test cattle ought to be kept in the house, fed on their usual food, and protected from draughts. They ought not to be allowed to drink large

quantities of cold water between the sixth and eighteenth hours after injection. It is well to take their temperature at least once on the day preceding the test.

2. The dose of tuberculin for a medium-sized cow is 3 cubic centimetres, or 50 minims, and it may be varied above or below that, according to the size of the animal. Large bulls ought to receive 4 cubic centimetres.

3. It ought to be injected under the skin with a clean hypodermic syringe. The most convenient points are in front of the shoulder or on the chest-wall behind the point of the elbow. The best form of syringe is one with an asbestos piston, as the whole instrument may be sterilised by boiling it in water for five minutes before use.

4. The tuberculin must be injected into the subcutaneous connective tissue, and care must be taken that the whole dose is introduced.

5. Ordinarily the temperature must be taken at the time of injection, and at the ninth, twelfth, fifteenth, and eighteenth hours afterwards. When there is any reason to suppose that the animal may have been already tested with tuberculin during the preceding two or three weeks, it is advisable to take the temperature at the third and sixth hours, as well as at the times just mentioned.

6. Animals in which the temperature during the eighteen hours following the injection rises *gradually* to 104° F. or more may be classed as *tuberculous*, and those in which it remains under 103° F. as *not tuberculous*. When the maximum temperature attained is under 104° F., but over 103° F., the case must be considered doubtful, and the animal may be retested after a month.

7. The test is not reliable in the case of animals in the last stage of the disease or in those in which the temperature is over 103° F. before injection.

8. The tuberculin should be kept in a cool place and protected from light. Should it become turbid or cloudy, it must not be used.

9. The tuberculin test does not render the milk in any way injurious.

Black Quarter Vaccine.

Black quarter vaccine is employed as a preventive agent against black quarter in cattle.

DIRECTIONS FOR USING BLACK QUARTER VACCINE, AS PREPARED AND SUPPLIED BY THE ROYAL VETERINARY COLLEGE, LONDON.

Two vaccines are employed—viz., first and second. The first vaccine is put up in the tubes *without* a black ring. The second vaccine is put up in the tubes *with* a black ring. Each tube contains vaccine sufficient for ten animals. An interval of eight to ten days ought to be allowed between the first and the second vaccination.

The apparatus necessary for the operation is :

1. A small mortar and pestle.
2. A graduated hypodermic syringe, with a capacity of 10 cubic centimetres. The needle of the syringe ought to be about as thick as an ordinary knitting-needle, and have a proportional bore.
3. A small pointed trocar or exploring needle, which ought to be a little thicker than the needle of the syringe.

Mixing of the Vaccine.—Immerse the mortar and pestle for ten minutes in water near the boiling-point. Have at hand a quantity of water recently boiled and allowed to cool. Rinse out the syringe first with 5 per cent. carbolic solution (in water), and then two or three times with boiled water.

Drain the mortar and pestle dry, and then turn into the former the contents of one of the small tubes (first vaccine for ten animals). Fill the syringe (10 cubic centimetres) with boiled (and now cold) water. Eject a few drops of this into the mortar, and triturate the powder with it so as to form a uniform paste. Continue the rubbing, and gradually add the whole of the water in the syringe. When the powder has thus been uniformly mixed with the water, suck the whole back into the syringe.

The Operation.—Clip the hair from the under aspect of the tail for about 6 inches, extending upwards from the tip.

Wash this part vigorously with 5 per cent. carbolic lotion. Take the small trocar, previously purified in boiling water, and bury it under the skin on the under surface of the tail, entering it on the middle line about a handbreadth above the tip, and pushing it vertically upwards for 3 inches. Give the handle of the trocar a side-to-side movement, so as to enlarge the gallery at its upper end. Now gently shake the syringe, insert the hypodermic needle, and inject one-tenth of the contents of the syringe (= 1 cubic centimetre). Withdraw needle and syringe together, at the same time pressing firmly on the puncture in the skin.

The Second Vaccination is carried out after eight or ten days in the same manner, the vaccine being injected under the skin of the tail, immediately above the seat of the first operation. After all the animals of one lot have been operated on, the syringe ought to be rinsed out with 5 per cent. carbolic solution. The operation ought not to be performed when the weather is very hot or very cold.

As an alternative to operating on the tail, the vaccine, mixed as above, may be injected under the skin in front of the shoulder. In that case the trocar is not required. The operation is more conveniently performed at this point than at the tail, but experience has shown that it involves a slightly increased risk of accident.

Every care is taken in the preparation of the vaccine, but no guarantee is given regarding its safety or efficiency.

Tetanus antitoxin, or Anti-tetanic serum.

This substance is employed, not only as a prophylactic agent, but also in the treatment of tetanus. When the disease is fully established the serum treatment is seldom successful, but in the earlier stages and in mild attacks it has given good results. Its chief use, however, is as a preventive agent. It is now extensively employed in horses suffering from punctured wounds, especially those affecting the feet. In districts where tetanus is frequently met with, it is judicious to employ the serum in all cases of punctured wounds and prior to operations. Its

influence in preventing the disease is now well known and accepted.

As anti-tetanic serum does not immunise for more than three weeks, and as the incubation period of tetanus may be one month, it is necessary to administer two injections of the agent—viz., one immediately and the second in two weeks afterwards.

When used for therapeutical purposes the injections must be repeated every six or twelve hours, according to the severity of the case. In mild cases one injection daily is usually sufficient, and the number of doses required will vary according to the progress of the case.

The serum is usually injected subcutaneously, but intracerebral injection has been occasionally employed. The results of the latter, however, have not been satisfactory. In injecting the serum aseptic precautions must be rigidly attended to. The syringe employed should be sterilised, and the skin shaved at the site selected for the injection, and disinfected with a 5 per cent. carbolic solution.

The usual site for injection is the lower region of the neck, where the skin is loose.

The usual dose of anti-tetanic serum for the horse is 1 ounce, repeated as indicated above.

The point of injection should be disinfected with the carbolic solution afterwards.

Anti-tetanic dusting-powder is now prepared, and suggested as a prophylactic against tetanus. It consists of equal parts of chloretone and dried anti-tetanic serum, and is intended as a dry dressing to wounds suspected of being infected with the tetanus bacillus. After the wound has been thoroughly cleansed with an antiseptic solution it is dried with sterile cotton. The dusting-powder is then freely applied, and the wound dressed in the ordinary manner. The dry anti-tetanic serum becomes dissolved in the wound, and its antitoxic properties are liberated. It is believed that the latter may render any tetanus toxin which may be present in the wound inert. As this method is not yet in general use, we cannot form an opinion of its practical value.

Anti-distemper Vaccine.

The anti-distemper, or canine anti-pasteurellic vaccine, is prepared, according to Dr. Phisalix, by growing the cocco-bacillus of canine distemper, or *Pasteurella canis*, in a 6 per cent. *glycerinated* bouillon, and allowing it to become attenuated gradually in proportion to age, and afterwards by re-insemination of *ordinary* bouillon, so as to obtain various degrees of attenuated virus or vaccine.

Lignières' vaccine is prepared from the *Pasteurella canis*,* derived from several sources. He grows this mixture of organisms on gelose-agar in series for more than a year by inoculating culture media every two days, so that they are renewed more than five hundred times, as he believes there is by this method less risk of the micro-organisms returning to their former virulence. For their preparation, the cultures are made in flat-bottom flasks, containing a layer of 1 to 2 cubic centimetres thick of peptonised bouillon. For the *first vaccine* the temperature of 42° to 43° C. is maintained for five days, and only two days for the *second vaccine*.

Phisalix's and Lignières' vaccines are living but attenuated cultures.

Copeman's vaccine is prepared from a cocco-bacillus isolated from the dog dead of distemper, which forms streptococci when grown on certain media, and liquefies gelatine—two characteristics not claimed for the *Pasteurella canis*, although Copeman has of late asserted that his micro-organism* is identical to that of Lignières and Phisalix. The bacillus is, however, destroyed by heating a broth-culture at 60° C. for half an hour; a small quantity of carbolic acid is subsequently added as a preservative. The vaccine is standardised according to the method devised by Haffkine and Wright in the preparation of anti-plague and anti-typhoid vaccines for man.

USE.—It is a preventive of distemper in the dog, cat, and

* Carré, of Alfort, has recently stated that the essential micro-organism of canine distemper is ultra-microscopic, and passes through certain filters.

ferret, and must be used, and immunity produced, before the animal is exposed to infection or manifests the disease. In hang-fire cases of distemper, without nervous complications, it seems to rouse the activity of the whole system, so as to bring about a quick improvement in the health of the animal.

AGE AT WHICH TO VACCINATE. — About two months of age is the most suitable period to vaccinate a puppy, as by that time it has been weaned and got accustomed to its artificial food. The second vaccination, with a more virulent vaccine, should be performed about ten or fourteen days later.

PRECAUTIONS BEFORE AND AFTER VACCINATION. — The puppy should be free from infection. In order to secure this (especially where dogs are being bred continuously for show purposes) the dam should be isolated from other dogs for some time before whelping, and this restriction should be maintained until at least a fortnight after the puppies have been vaccinated a second time.

After vaccination, or, rather, during the vaccinal process, the young puppy should have a sufficiency of suitable food and be kept free from chills, in a warm, dry, and clean place, and not allowed to eat filth.

DOSES.

1. *Phisalix's Vaccine.*

- (a) First or weak vaccine, 2 cubic centimetres (approximately, 34 minims).
- (b) Second or stronger vaccine, 2 cubic centimetres for a puppy of eight weeks; $2\frac{1}{2}$ cubic centimetres for a puppy of ten weeks; 3 cubic centimetres for a puppy of twelve weeks.
- (c) Third or strongest vaccine, 2 cubic centimetres, or, in lieu of this, 4 cubic centimetres of the second vaccine.

This last is sometimes used two or three months after the second inoculation.

2. *Lignières' Vaccine*.—First and second, 1 cubic centimetre.

3. *Copeman's Vaccine*.—Similar doses to those of Phisalix's vaccine.

SEAT OF INOCULATION.—The first and second vaccines, which are supplied in separate phials or tubes, are injected under the almost hairless skin inside the thighs or under the abdomen, taking care that the second injection is made on the opposite side of the body to the first. The vaccination syringe should be sterilised before and after use, but no antiseptics should be used either on the skin or for the syringe.

Anti-distemper or Anti-pasteurellic Serum.

Lignières prepares a polyvalent preventive and curative serum by inoculating horses with progressive doses of his anti-pasteurellic polyvalent vaccine. At first small but repeated doses are made under the skin; but as soon as the horse acquires a certain degree of tolerance they are afterwards made into a vein, until the animal becomes highly hyper-immunised.

USES.—The serum, which only produces a temporary or passive immunity, should be injected under the skin as soon as possible after exposure to infection, such as after a dog-show, or even before going to a show, or if already suffering from the disease in its earliest stage. In the secondary infections no utility is claimed for it. Gray has tried it in the early stage of those cases which are complicated by pneumonia, and found that although it caused a temporary improvement, the animals in the end succumbed.

DOSE.—This varies according to the size of the dog and the acuteness of the disease. However, an immense quantity may be given without danger. As a rule it is advisable to use 10 to 20 cubic centimetres for the first day, 5 to 10 cubic centimetres for the second day, and $2\frac{1}{2}$ to 5 cubic centimetres for the third day. In the rapid or septicæmic form of the disease these doses should be doubled.

NOTE.—All vaccines or sera, or, in fact, any biological

product intended for therapeutic use, should be kept in a cold and dark place, such as a cellar, or preferably an ice-chamber, as light and heat cause their deterioration. The contents of a phial, which should be fresh, sweet, and free from flocculi or great turbidity, should be used up as soon as the bottle is opened.

Polyvalent Anti-streptococcic Serum

(Anti-gourmous or Anti-strangles Serum).

A special polyvalent anti-streptococcic serum is prepared by Marmorek at the Pasteur Institute, for veterinary purposes. It is the blood-serum of a horse, hyper-immunised with progressive doses of the virulent culture of various strains of streptococci of equine origin.

It should not be confounded with the serum bearing the same name for human use, which is prepared in a similar manner, but various strains of streptococci of human origin are used, instead of those of equine origin.

USES.—It is said to give immunity to strangles, if injected during the early febrile stage or the incubative period. In this case a single dose of 30 cub. centimetres is sufficient to reduce the temperature to normal. It is also of use during the early clinical stage of the various manifestations of strangles before the glands commence to suppurate. In purpura hæmorrhagica it is of great value. It has also been used locally and hypodermically in the treatment of tardy healing of wounds and ulcers. It may be tried in erysipelas, lymphangitis, and septic metritis.

In the dog, Gray has had rapid success by its use in tonsillitis, with high fever, total loss of appetite, and depression, in delicate animals. Even one dose of 10 cubic centimetres has brought about complete disappearance of the systemic phenomena in a few hours. It may be tried in streptococcic infection complicating distemper, and also in puerperal fever of bitches. It should be administered in large and repeated doses until all symptoms of disease have abated or disappeared. It is quite harmless, even if immense quantities are injected.

It may be injected subcutaneously in any place where the skin is loose, taking care that no two injections are made in the same spot. For the local treatment of wounds, it is brushed on the surface of the wound.

The polyvalent anti-streptococcic serum for human use is beneficial in some forms of purpura hæmorrhagica of the horse.

DOSES.—*For the horse* : 10 to 30 cubic centimetres, morning, noon, and night. In ordinary cases, 10 cubic centimetres, injected three times a day, are sufficient. It should be repeated until the symptoms have disappeared. *For the dog* : 5 to 10 cubic centimetres.

NOTE.—Dassonville and De Wissocq speak hopefully of rendering horses actively immune to strangles by the combined use of a streptococcic vaccine and an anti-streptococcic serum—sero-vaccination.

Anti-anthrax Vaccine and Serum.

Pasteur, Chamberland, and Roux in 1880 devised a method of attenuating the virus of anthrax, so that it could be used as a vaccine. They cultivated the bacillus of anthrax in media exposed to the action of the oxygen of the air; but, to prevent the bacillus forming spores, the cultures were kept at a temperature of 42° to 43° C. for twelve days, when it no longer killed adult guinea-pigs. After thirty-one days' exposure to this temperature it still killed very young mice, but not the guinea-pig, rabbit, and sheep; and after forty-one days it lost all action, even for the new-born of mice and guinea-pigs.

When sub-cultures were made from one of these modified cultures, and kept in an incubator at a temperature of 37° or 38° C., the bacillus formed spores, but its virulence was that of the modified stock of bacilli. By these means various degrees of virulence of the cultures were obtained which could be used for protective inoculation.

The vaccines are sent out from the Pasteur Institute in tubes containing a sufficient quantity for 100, 200, or 300 head of sheep.

DOSES. — *For sheep*: $\frac{1}{8}$ cubic centimetre of the first and second vaccines. The first vaccine is injected under the skin in the middle of the inside of the thigh. The second or strong vaccine is injected in a similar manner on the opposite thigh twelve to fifteen days after the first inoculation. *For the horse and ox*: $\frac{1}{4}$ cubic centimetre of each of the first and second vaccines. The first vaccine is injected under the thin and loose skin behind the elbow of the ox and under the skin on the lateral surface of the neck, equidistant from the top of the mane to the jugular furrow, of the horse. The second vaccine is injected on the opposite side twelve to fifteen days after the first inoculation.

The second vaccine must *not* be used unless the first vaccine has been injected twelve or fifteen days previously. The vaccination should be carried out in the early spring, before the warm weather sets in. However, in this country outbreaks are not periodical, but occur at all times of the year.

Immunity is conferred about a fortnight after the second inoculation, and lasts about a year.

Chauveau's Vaccine.

This is prepared from bacilli attenuated by the action of compressed oxygen on the spores. The spores thus attenuated are grown in fowl-broth, and the culture is kept in an incubator having a temperature of 36° to 37° C., which is maintained for thirty days.

DOSES. — *For sheep*: $\frac{1}{20}$ cubic centimetre. *For the ox*: $\frac{1}{10}$ cubic centimetre.

The advantage of Chauveau's method over that of Pasteur's is that one inoculation is sufficient to confer immunity, which lasts about a year.

ACCIDENTS OF VACCINATION.

Although in a very great majority of instances anti-anthrax vaccinations are not followed by any local or general disturbance, there are times when either the first

or second inoculation is succeeded by glandular swellings and lameness, or by very large and diffuse swellings, with general disturbance, such as great prostration, loss of appetite, fever, and in dairy cows diminution or suspension of milk. In other cases, especially in Great Britain, the inoculations have ended in death of the animals.

Some attribute these accidents to the over-virulence of the vaccines; others, to the great susceptibility of the inoculated; and, finally, many ascribe them to the latent infection the animals were subject to at the time of the vaccinations.

It is not advisable to use this vaccine in fresh pastures where anthrax is not prevalent or where the loss is very small. It should, however, be used where the disease is very prevalent and the mortality great. In this country the disease would appear to be chiefly exogenous in its origin, and to be introduced mainly by the importation of foreign hides, wool, hair, bone manure, foreign foods, etc.

Some breeds of sheep, such as the Algerian Barbaro-Syrian cross-breed, the Persian and the Anglo-Persian, are naturally immune. However, inoculation increases this immunity to a greater degree.

Anti-Anthrax Serum.

During the last ten years several attempts have been made—notably by Sclavo, Marchoux, Sobernheim, Mendez, and Carini—to produce an anti-anthrax serum for preventive and curative purposes in man and animals.

The rabbit and sheep, and also the horse, may be hyper-immunised by using repeated and gradually increased doses of anthrax cultures. Their blood then contains a serum endowed with preventive and curative properties.

Sobernheim and also Sclavo found that by the simultaneous inoculation of serum and a virulent culture complete immunity was conferred. No second inoculation is necessary.

Recently, Sclavo has perfected his method of serum production so as to bring it within the range of practical therapeutics.

Sclavo's bacteriolytic serum has been used by practising physicians in this country with success in cases of local anthrax or malignant pustule.

Anti-Swine-Erysipelas Vaccine and Serum.

In 1882 Pasteur and Thuillier demonstrated that by passing the bacillus of swine-erysipelas through a series of pigeons, its virulence became so increased that it killed these animals in a shorter and shorter time. When repassed back into the pig, this virulence was maintained. On the other hand, they showed that when the bacillus was passed through a series of rabbits, its virulence became progressively increased for these animals, but gradually attenuated for the pig. Therefore, by these two means two series of virus, having opposite degrees of virulence, were obtained.

By simply exposing the cultures to the air for varying periods, progressive degrees of attenuation are realised, so that they can be used as virus vaccines. According to the degree of virulence of these vaccines, so is the degree of active immunity obtained. A very weak virus does not produce a sufficient or lasting resistance, whereas a strong one, although it renders an animal refractory, is liable to produce serious illness or death. Therefore, it is advisable to use the weaker first and the stronger afterwards. A pig thus treated is immunised without danger. This immunity may last at least a year. These vaccines are distributed from the Pasteur Institute in Paris and Lille.

The operation is made during the winter months (December to March), before the warm weather sets in, so that the risk of the animals having the infection within them is lessened. It is advisable to inoculate the pigs when they are from two to four months of age, as they are at this period of their life less sensitive to the attenuated cultures, and therefore not so liable to develop the disease from inoculation.

The first inoculation is made under the skin inside the right thigh. The dose is $\frac{1}{8}$ cubic centimetre. The second vaccine is inoculated in a similar manner in the left thigh,

allowing an interval of twelve to fifteen days between the two inoculations. Immunity is by this method gradually brought about and completed about twelve days after the second inoculation. Breeding sows and boars should be vaccinated every year.

Sero-Vaccination.

Precautionary Sero-therapy.—Dangerous accidents are liable to arise if the pigs are vaccinated when suffering from latent infection. To obviate these, Leclainche has introduced a method that gives every guarantee of success. He recommends an antitoxic serum obtained from hyper-immunised horses treated with progressively virulent cultures of the swine-erysipelas bacillus.

DOSES.—Of the serum thus obtained he injects 10 cubic centimetres into pigs weighing under 50 kilogrammes, and 20 cubic centimetres into those over this weight, when they have been exposed to infection or are already suffering from the disease in its earliest manifestation.

The *passive immunity* thus conferred is only of a short duration, probably within a fortnight. It is advisable to supplement it by creating *active immunity* with the two inoculations of virus.

The animals having undergone this precautionary inoculation with serum, may be inoculated eight or ten days later with a mixture of serum and virus for the first vaccination, and twelve days after this with pure virus minus serum. The quantity of vaccine to inject at each inoculation is fixed at $\frac{1}{2}$ cubic centimetre.

The quantity of serum to be injected with the vaccine for the first inoculation varies according to the weight of the pig. Five cubic centimetres is the minimum dose for pigs under 50 kilogrammes in weight; 1 cubic centimetre to be added to this dose for every additional 10 kilogrammes. The maximum additional dose of 10 cubic centimetres is sufficient for animals weighing 100 kilogrammes and beyond.

The mixing of the serum and vaccine is made in the syringe at the time of inoculating. The vaccine is supplied

in bottles having affixed to them a red label, and the serum in bottles with a yellow label. They are supplied direct from the Toulouse Veterinary School.

Sero-therapy or Curative Treatment.—As a curative the serum should be used as early as possible after the symptoms of the disease have appeared. In a few animals it may make no impression on the disease if injected five or six hours after its commencement, whereas in others recovery may take place when used after twenty-four or more hours have elapsed. It is advisable to renew the injections every six hours until all symptoms have disappeared. It is quite harmless, and acts by stimulating the phagocytes, which englobe and digest the living virulent bacilli.

‘Art is born of the observation and investigation of Nature.’

CICERO, Orat. lv., 183.

‘It cannot be denied that we have learned more rapidly how to prevent than how to cure diseases ; but, with a definite outline of our ignorance, we no longer live now in a fool’s paradise, and fondly imagine that in all cases we control the issues of life and death with our pills and potions.’

OSLER.

PART III

SPECIAL THERAPEUTICS

CHAPTER I

INTRODUCTORY

IN the following chapters we propose to consider the principles of treatment as applied to those diseases which are usually met with in practice, and in which treatment may prove of benefit. In equine practice, with few exceptions, maladies that are incurable, and that render the animals either unfit or unsafe for work, cannot repay the cost of treatment; hence, from a therapeutical point of view, they do not prove as interesting as from a pathological aspect. Unless a horse can be rendered fit for work of some kind, he is of no value, and we cannot conscientiously continue to treat him.

In canine practice it is different. There is a sentimental value attached to the dog, and so long as the animal is not suffering pain that cannot be relieved, we are justified in advising treatment.

No hard-and-fast rules can be laid down with reference to the treatment of any affection. It is often a matter of difficulty to decide which is the *best* medicinal agent or line of treatment to employ when there are several to choose from. Nor is it always easy to ascertain the exact part that drugs play in the process of recovery of the patient.

The natural tendency to recovery must be always before our mind in drawing conclusions as to the therapeutical value of medicinal agents, or the superiority of one drug over another in the treatment of special diseases. The

important matter is to distinguish consequences from coincidences, and fact from imagination.

The first essential in the rational treatment of a case is to ascertain as far as possible the abnormal conditions that are present. Having decided on this point, we then consider what means we can adopt to exert a favourable influence on these conditions. We require more knowledge with reference to a disease than simply its name; we must be aware of the effects that are produced on the various organs, of the dangers to life that may occur, and of the sequelæ and complications that may arise. This implies a careful clinical study of disease, as well as a knowledge of pathology. Theory unless applied is of little value, and the simple reading of text-books, without actually observing and examining cases, will not enable the student to recognise the indications for treatment. Committing to memory a list of agents which may be used in the treatment of each disease proves of no value when he is brought into actual contact with a case. In the words of an eminent teacher, 'Reading text-books without studying cases clinically is like eating sawdust.'

It is neither necessary nor desirable to direct our entire attention to forming a diagnosis, and to ignore the symptoms that call for immediate treatment. In many instances the element of probability enters largely into the question of diagnosis, and we must remember that it is by no means uncommon for errors to occur in this direction. To defer treatment until we are able to arrive at a definite diagnosis, however scientific such a course of action may appear to be, is not doing justice to our patient, nor is it likely to succeed in practice. In obscure cases—and many will come under this category—we must treat the leading symptoms and await developments. This treatment should be simple, and so directed that it will not prove detrimental to the progress of the case. It will usually consist of attending to the general comfort of the patient, and to hygienic and dietetic details, and in seeing that the bowels and kidneys are performing their functions.

If rigors be present, a few doses of diffusible stimulants are indicated, and the animal should be warmly clothed and the legs bandaged.

If evidences of cardiac weakness are present, the judicious employment of stimulants is required. The presence of pain will also require appropriate attention. A definite diagnosis can be made when symptoms develop, and the treatment can be modified according to the requirements of the case.

It is impossible to understand the principles of rational treatment without first becoming acquainted with the pathology of the diseases, and with the causes of the symptoms by which these abnormal conditions are evidenced.

In the following chapters only a brief consideration of these points is given; hence the student must become familiar with pathology and semiology before commencing the study of therapeutics. It is of very little practical use to learn that certain medicinal agents are employed in the treatment of certain diseases unless he is aware of the manner in which they exert a favourable influence on the morbid conditions. No doubt there are some affections in which, by reason of their obscure nature, we still adopt empirical treatment, but scientific investigation is gradually enabling us to explain the *modus operandi* of the medicinal agents that prove successful in such instances.

In the course of practice doubts and probabilities will often arise with reference to the most advisable line of treatment to adopt. Self-confidence is eminently necessary in the practitioner if he is to inspire confidence in his client. This, however, should not prevent him from recognising the fact that errors will occur in spite of all precautions, and that he must be prepared to modify his treatment when necessary. The important matter is to avoid expressing doubtful opinions that may be construed by a client as a confession of ignorance. A guarded line of treatment is often as necessary as a guarded opinion with reference to diagnosis or prognosis. In the words of a great clinical teacher, 'If you must wait before forming even a probable

opinion, at any rate be decided in delay. Remember, decisive hesitation is far wiser than hesitating decision.'

One of the most important points in connection with the treatment of a case is to avoid the indiscriminate prescribing of drugs. We must carefully consider the phenomena that are presented, and direct our efforts so as to exert a favourable influence on the progress of the case.

In many affections we find that the influence which we can exert by means of drugs is very limited, and that simple remedies, combined with attention to dietetics and the general comfort of the patient, are far more likely to bring about successful results than relying on the effects of potent medicinal agents. Perhaps the most frequent cause of indiscriminate prescribing is the common idea that we are not doing all that is possible for the patient. The junior practitioner is apt to err in this respect, especially if he is so unfortunate as to possess only a theoretical acquaintance with disease, and has not had the advantage of a thorough clinical training. It is in connection with this subject that a 'judicious distrust' in the virtues of drugs is likely to prove of service.

In addition to dietetics and hygiene, a very important factor in therapeutics, as applied to the horse, is *rest*. This, of course, implies cessation from work for a proper period of time, in order to assist the natural process of recovery.

Another important aid to complete recovery is to send the animal on grass when convalescent, provided the weather is suitable. This often proves more valuable as a tonic and restorative than any form of treatment with drugs. In it we have the combination of a change of diet, pure air, and gentle exercise. The beneficial influence exerted by this simple measure during convalescence in both medical and surgical cases is so well known that further comment thereon is not necessary.

CHAPTER II

THE TREATMENT OF DISEASES OF THE DIGESTIVE ORGANS

SECTION I.

THE TREATMENT OF DISEASES OF THE MOUTH AND PHARYNX.

Stomatitis, or inflammation of the mucous membrane of the mouth, may be caused by local irritation, contact with acrid materials, extension of disease from contiguous parts, gastric disorders, and, in the parasitic form, from the development of a vegetable growth—the *Oidium albicans*—in the mucous membrane. Different forms of the affection are recognised, such as simple or catarrhal, vesicular, pustular, and ulcerative.

Stomatitis is more frequently met with in young animals, and as predisposing causes we may mention the process of dentition, defective sanitary surroundings, and improper feeding. The symptoms which lead us to recognise the condition are—difficulty in feeding, an accumulation of ropy saliva in the mouth, and sometimes a fœtid odour from the breath. An examination of the mouth will reveal the form of the disease that is present.

Treatment will consist in prescribing diet of a soft nature, and paying attention to the surroundings of the patient. Emollient, astringent, and antiseptic washes will be indicated to reduce the inflammation of the buccal membrane and to cleanse the mouth. These may consist of borax, chlorate of potash, glycerine, etc. In the ulcerative form, when the ulcerated spots do not tend to heal, a solution of nitrate of

silver (10 grains to the ounce of water) should be carefully applied every second day with a camel's-hair brush. As a laxative for the horse, 2-ounce doses of sulphate of magnesia should be given twice daily in the drinking-water.

Congestion of the Buccal Membrane—a congested condition of the buccal membrane, particularly along the palatine surface, and most marked behind the incisor teeth—is popularly known as ‘lampas,’ and much unnecessary importance is attached to it by owners and attendants of horses. It is a symptom in the young of dental changes, while in the adult it may be an indication of gastric derangement, or of irregularities of the molar teeth. In some horses this part is normally full and loose, and does not interfere with mastication.

In the dental form in young horses, if the swollen palatine surface interferes with feeding, the congestion should be relieved by scarifying the part. In adults examine the teeth, and treat irregularities of the molars if present. Attention should be directed to the gastric functions, and suitable measures prescribed if found necessary.

Ptyalism, or Salivation, is an excessive secretion of saliva, which escapes slowly from the lips, or collects in the angles of the mouth. It is a symptom of various conditions, and, in order to adopt rational treatment, we must discover the cause.

We first make a careful examination of the mouth and pharynx, and look for the presence of foreign bodies, irregularities of the molar teeth, the existence of pharyngitis or laryngitis, evidences of irritation of the tongue and buccal membrane from the administration of irritant medicines not properly diluted, or from irritating materials in the food. Any of these conditions, if present, will require appropriate treatment. The mouth should be washed out three times daily with a solution of chlorate of potash or boric acid, to which a little glycerine or honey may be added. In severe cases belladonna may be added to the above with advantage.

A form of ptyalism is met with as the result of absorption of mercurial dressings to the skin or the internal administration of mercury. This is known as ‘mercurial salivation,’

and is more common in canine practice. It is accompanied by a fœtid odour from the breath, tenderness of the gums, which bleed easily, and symptoms of general debility. It is treated by ordering a cessation of the drug or dressings, and by administering the chlorate of potash internally. The mouth should be washed three times daily with a solution of boric acid and tincture of myrrh. In severe cases small doses of belladonna internally are indicated. The food should be of a soft nature, so as not to add to the existing irritation.

Ptyalism is a symptom in rabies and tetanus. In these cases hypersecretion of saliva is not present, but there is inability to swallow the amount secreted. Ptyalism is also met with in cases of actinomycosis and of foot-and-mouth disease in cattle.

Glossitis, or inflammation of the structure of the tongue, is rarely met with as an idiopathic affection. It usually results from mechanical injuries, wounds from sharp and irregular teeth, rough handling when medicines are being administered, and from drenching with agents of an irritating character, such as oil of turpentine, preparations of ammonia, chloral hydrate, etc., when such are not suitably diluted with bland solutions.

The leading symptoms are—difficulty in mastication and deglutition, an accumulation of saliva and mucus in the mouth, swelling and tenderness of the tongue, while in severe cases this organ protrudes from the mouth. When the affection arises from contact with irritating agents, the outer covering of the tongue peels off in bluish-white layers, leaving denuded patches of corium of a scarlet colour.

In adopting treatment, we first make a careful examination of the mouth, and having as far as possible ascertained the cause of the affection, we prescribe antiseptic, soothing, and demulcent mouth-washes, containing boric acid, chlorate of potash, belladonna, with honey and glycerine. The food should be limited to oatmeal-gruel, milk, linseed-tea, etc., until the tongue assumes a healthy character, and the animal should remain at rest. As a laxative, Epsom salt may be given twice daily in the drinking-water.

In all cases of loss of appetite without any appreciable cause, difficulty in mastication, loss of condition, etc., a careful and systematic examination should be made of the mouth and teeth. In order to carry this out a suitable mouth-gag is necessary, and unless this is used there is always a chance of errors in diagnosis and of important conditions being overlooked. We need only mention the retention of temporary molars, or the presence of a foreign body in the region of the mouth, or a sharp projecting portion of a tooth.

In canine practice similar precautions are necessary, and the mouth-gag invented by Mr. H. Gray, London, will be found indispensable for this purpose.

In dogs, foreign bodies such as needles, sharp pieces of bones, etc., are frequently met with in the posterior portion of the mouth or wedged between the teeth. These may give rise to symptoms that might be mistaken for those of rabies, unless a careful examination be made.

FORMULÆ.

Mouth-wash for Simple Stomatitis in the Horse.

R	Potassii chlorat.	...	...	...	̄ii.
	Boracis	...	...	...	̄iii.
	Glycerini	...	...	...	̄ii.
	Aquæ	...	...	..	ad O.i.

M. F. lotio. Sig.: Rinse the mouth with two wineglassfuls of this lotion three times daily.

Mouth-wash for the Dog.

R	Boracis	...	...	...	̄ii.
	Sodii bicarb....	...	...	...	grs. xl.
	* Tinct. eucalypti	...	...	...	̄i.
	Glycerini	...	...	...	̄ss.
	Aquæ...	...	...	...	ad ̄viii.

M. F. lotio. Sig.: Rinse the mouth with this lotion three times daily.

* Tincture of eucalyptus is prepared with 1 part of eucalyptus leaves in rectified spirit to produce 5 parts of tincture.

Mouth-wash for Parasitic Stomatitis in the Dog.

R	Boracis	...	...	...	̄iv.
	Glycerini	...	...	...	̄iv.
	Tinct. myrrhæ	...	...	...	̄ii.
	Aquæ camphoræ	...	...	...	ad ̄viii.

M. F. lotio. Sig.: Apply two or three times daily.

Mouth-wash for Ulcerative Stomatitis.

R	Potassii chlorat.	...	...	...	grs. lxxx.
	Ext. opii liq.	...	...	...	̄i.
	Aquæ laurocerasi	...	...	...	̄i.
	Aquæ camphoræ	...	...	...	ad ̄viii.

M. F. lotio.

For Fetid Breath, Spongy and Bleeding Gums in the Dog.

R	Ac. hydrochlor. dil.	...	...	...	̄i.
	Tinct. eucalypti	...	...	...	̄ii.
	Aquæ...	...	...	...	ad O.i.

M. F. lotio. Sig.: Apply to the gums with a brush twice daily.

Mouth-wash for Mercurial Stomatitis.

R	Potassii chlorat.	...	...	...	̄ii.
	Tinct. opii	...	...	...	℥ xx.
	Aquæ laurocerasi	...	...	...	̄i.
	Aquæ...	...	...	...	ad ̄vi.

M. F. lotio.

Mouth-wash for Glossitis in the Horse.

R	Potassii chlorat.	...	...	...	̄ss.
	Ext. belladonnæ vir.	...	...	...	̄ii.
	Mel. boracis...	...	...	...	̄iv.
	Glycerini	...	...	...	̄iv.
	Aquæ...	...	...	...	ad O.i.

M. F. lotio. Sig.: Use as a mouth-wash three times a day.

The Treatment of Diseases of the Pharynx.

Acute Pharyngitis; Acute Pharyngeal Catarrh; Inflammation of the Pharynx; Sore Throat.—This may occur as an independent affection or may accompany other diseases, such as strangles or influenza. The larynx is frequently involved in the inflammatory process, and a differential diagnosis is by no means easy. In the early stages a dry

and swollen condition of the mucous membrane is present. This is succeeded by the secretion of a tenacious mucus, which in severe cases may assume a catarrhal or purulent character.

Among the causes, we may mention exposure to cold and damp, a vitiated atmosphere depending on defective hygienic surroundings, the extension of catarrhal inflammation from neighbouring structures, irritation proceeding from the process of dentition in young animals, strangles, and the action of mechanical and chemical irritants.

In dogs we meet with cases of chronic pharyngitis, often accompanying gastric catarrh.

Acute pharyngitis of a septic character may occur as the result of injury to the region of the pharynx, caused by the attendant endeavouring to administer a bolus by means of a pointed stick.

The prominent symptoms observed in pharyngitis are a difficulty in swallowing, the act of deglutition inducing a fit of coughing, fluids are returned through the nostrils, there is increased secretion of saliva, and more or less swelling in the region of the throat, which is tender to pressure. When complicated with laryngitis a degree of respiratory distress is present, varying according to the severity of the case; the cough is more troublesome and the temperature raised.

In pharyngitis of a septic form there is present, in addition, fœtor of the breath, more diffuse swelling of the region of the throat, and febrile symptoms.

Chronic pharyngitis in the dog is characterised by frequent fits of irritable, hacking coughing, and attempts as if to get rid of a foreign body from the throat. Tenacious mucus, mixed with saliva, is often coughed up.

In the treatment of pharyngitis in the horse, we first ascertain if the condition is limited to the pharynx or if a respiratory affection is present as well. Medicated inhalations are indicated, consisting of the vapour of hot water, containing agents such as terebene or oil of eucalyptus. All drenches are to be prohibited, but medicines such as bella-

donna and camphor, combined with glycerin or honey, may be administered in the form of electuary, while chlorate of potash may be given, dissolved in the drinking-water. In severe cases a cantharides blister should be applied to the region of the throat ; this gives marked relief, and overcomes the difficulty in swallowing. The food should be of a soft nature, and consist largely of oatmeal-gruel, milk, linseed-tea, etc.

In cases of septic pharyngitis the use of antiseptic agents such as carbolic acid, cyllin, or lysol, should be added to the inhalations.

Chronic pharyngitis in dogs, often accompanying chronic gastric catarrh, is best treated by the administration of moderate doses of the bicarbonate of soda in solution, and means should be adopted to overcome the gastric affection. Attention to the general health is also necessary.

In obstinate cases, where medicated inhalations fail to give relief, we apply a linctus of nitrate of bismuth with glycerine to the pharynx once daily.

A careful examination of the pharynx should always be made in cases showing a persistent hacking cough as a prominent symptom.

FORMULÆ.

Electuary for Acute Pharyngitis in the Horse.

R	Pulv. camphoræ	...	...	̄ss.
	Pulv. myrrhæ	...	...	̄ss.
	Potassii chlorat.	...	...	̄i.
	Ext. belladonnæ vir.	...	...	̄ss.
	Mellis	...	...	̄iv.
	Glycerini	...	...	̄iv.

M. Sig. : Give a tablespoonful four times a day on the back of the tongue.

Mixture for Acute Pharyngitis in the Dog.

R	Potassii chlorat.	...	...	̄i.
	Liq. ammonii acetatis	...	...	̄i.ss.
	Mellis	...	...	̄ii.
	Glycerini	...	...	̄i.
	Aquæ...	...	...	ad ̄vi.

F. m. Sig. : Give from a teaspoonful to a tablespoonful every four hours.

Linctus for Chronic Pharyngitis in the Dog.

R	Bismuthi subnit.	...	...	grs. xx.
	Glycerini	...	..	ʒii.

M. F. linctus. Sig.: Apply with a soft brush to the pharynx twice daily.

The Treatment of Diseases of the Œsophagus.

Œsophagitis, or inflammation of the structures composing the gullet, may arise from irritating liquids administered through mistake, in which instance the mouth and pharynx also suffer from the effects of the irritant. The swallowing of sharp-edged foreign bodies, or the careless passing of a probang introduced for the purpose of relieving the condition known as choking, or external injuries, may produce it.

Difficulty in swallowing, sometimes the ejection through the nostrils of food during deglutition, restlessness, pawing, extension of the head on the neck, and fits of coughing, are some of the symptoms that may be observed.

In slight cases simple treatment is all that is necessary. Soft diet, linseed-gruel, milk, and linseed-tea should be allowed. Barley-water is also useful. Chlorate of potash may be dissolved in the drinking-water, and the latter should be liberally supplied.

When the swallowing of caustic agents is the cause of the affection, special treatment is necessary. For the mineral or caustic inorganic acids, lime-water, magnesia, etc., may be given, combined with mucilaginous agents such as honey, olive-oil, linseed-tea, barley-water, etc. For the caustic alkalies very dilute acetic acid combined with honey is indicated.

If pain be a marked symptom an opiate is necessary. An electuary of belladonna with potassium chlorate and honey is also useful, repeated at intervals.

Local treatment, consisting of fomentations to the region of the œsophagus and the application of belladonna, may also be carried out in severe cases.

Spasm of the œsophagus is a rare condition, depending on obscure causes and occurring at irregular intervals. Solid

food especially is arrested in its passage down the gullet, and spasmodic attempts seem to be made by the animal to eject it. In some instances it is swallowed after a short period; in others the animal's head is bent towards the sternum, and as the result of the spasmodic efforts made the food is ejected through the nostrils. In other cases the food accumulates in the œsophagus, and the ejection is carried out with a slight degree of spasm.

Treatment is unsatisfactory. Some practitioners have found the hypodermic injection of morphine combined with atropine of some service; nerve sedatives may also be given. The food should be soft and unirritating.

For information on the treatment of dilatation and stricture of the œsophagus and the treatment of 'choking,' the student is referred to works on veterinary surgery.

CHAPTER III

THE TREATMENT OF DISEASES OF THE DIGESTIVE ORGANS (*continued*)

SECTION II.

THE TREATMENT OF DISEASES OF THE STOMACH.

DISEASES of the stomach form a subject of the greatest importance to the veterinary therapist. Marked differences exist as regards the formation of the stomach in the equine, bovine, and canine species, and as a result we find that diseases of the organ in these various species show certain peculiarities, and require separate consideration.

Although gastric affections are of more common occurrence in ruminants and dogs than intestinal disorders, while in the horse the latter are more frequently met with, we must not conclude that gastric affections in the equine species are rare. Indeed, the more we study the clinical aspect of the subject, we are inclined to believe that the stomach of the horse is more often the seat of disease than is usually imagined.

In all animals we must regard dietetic errors as being the chief factor in the production of gastric disorders; hence in attempting treatment we must pay special attention to regulation of the diet, as in the absence of this detail medicinal agents will not prove of benefit. A proper knowledge of the subject of dietetics is absolutely essential to the practitioner, both in the immediate treatment and in the prevention of the diseases we are considering.

In the treatment of gastric affections in the horse we meet with great difficulties. In the first place, we cannot

induce vomition, and consequently are unable to get rid of the gastric contents by this means in cases of impaction of the organ.

Again, in the same affection we find that the walls of the stomach become paralysed, and the medicinal agents administered produce very little effect.

It is by no means easy to diagnose in an accurate manner the different gastric affections in the horse, or to differentiate between gastric and intestinal disorders in many instances. Experience of autopsies in such cases teaches us that we cannot rely too implicitly on what are said to be diagnostic symptoms.

The Treatment of Dyspepsia or Indigestion in the Horse.

These terms are applied to a variety of functional disorders of the stomach, the leading feature being interference with the function of digestion, which produces certain effects on the system. In some instances dyspepsia exists as a distinct affection, depending on some functional interference with the nervous or vascular mechanism of the stomach, no structural alterations being present. In others dyspepsia or indigestion is merely a symptom of a gastric affection.

Thus in the different disorders of the stomach, such as acute gastric catarrh, chronic gastric catarrh, gastric impaction, acute gastric tympany, symptoms indicative of indigestion must of necessity be present in greater or less degree.

In the horse it is often very difficult to distinguish what is known as dyspepsia, or chronic indigestion, from the condition termed chronic gastric catarrh, or chronic gastritis. The former is a symptom of the latter affection, and although theoretically we distinguish one from the other, we find that clinically the *cause* of dyspepsia is by no means easy to discover. Errors in diet are no doubt responsible for the majority of cases of chronic indigestion, and also of chronic gastric catarrh.

Excess of food, dental irregularities interfering with mastication, irregular feeding, long fasts, food of bad quality, or food unsuited to the wants of the animal—these may be cited as causes of dyspepsia.

The effects produced on the stomach are very important ; these consist of alterations in the amount and character of the gastric secretion, interference with the normal movements of the organ, and irritation of the gastric mucous membrane.

As a sequel to severe, exhausting affections such as influenza, we frequently observe a dyspeptic condition. This may arise from some alteration in the normal action of the gastric nerves, or may depend on a chronic catarrh of the gastric mucous membrane.

In foals we meet with a form of indigestion due to an irregular milk-supply, as in cases where foal and dam are separated for long intervals, the latter being kept at work. In such instances the functions of the stomach of the young animal become disordered, and there is inability to digest the extra amount of milk which it takes after a long fast. The milk itself becomes altered in character in the udder of the mare, which renders it less capable of digestion. The usual result is diarrhœa, which often assumes a very serious character.

The symptoms of dyspepsia in the horse are by no means constant. The animal is out of condition and dull, the skin is unhealthy in appearance, loses its normal character, and seems to adhere to the underlying structures ; this is termed in popular language 'hidebound.' The appetite is capricious, at some periods being normal, while at others very little food is taken.

If there be excessive acidity of the stomach, the animal will crave for alkaline substances, and will lick the walls of the stable, and eat clay when opportunity offers. In some instances the appetite becomes depraved, and the animal will even eat his own excreta. A sour and pasty condition of the mouth is a frequent symptom, and congestion of the buccal membrane (popularly termed lampas) is often present.

Among other symptoms met with we may mention thirst and a cough of obscure origin, irregular action of the bowels, and alterations in the character of the pulse. The latter is an important symptom, as the irregularity and alteration in the pulse-rate might be attributed to the

presence of a cardiac affection, unless care be exercised in the diagnosis. In some cases attacks of vertigo or megrims occur as the result of dyspepsia, and depend on reflex irritation. These may disappear when the stomach assumes its normal functions (see p. 544).

Intermittent attacks of colic occurring an hour or two after feeding are also observed in cases of chronic indigestion, and more particularly when chronic gastric catarrh exists as the cause of this condition. All the symptoms present are referable to interference with normal digestion. The ingesta, not being properly acted on by the gastric secretion, undergo fermentation, and a condition of excessive acidity is brought about; irritation of the gastric mucous membrane is produced, and general nutrition is interfered with. In some cases diarrhœa may occur shortly after feeding, or when the animal is at work. As previously remarked, it is difficult, if not impossible, clinically to distinguish functional dyspepsia from chronic gastric catarrh. In the latter affection the symptoms are usually intensified.

In the *treatment* of dyspepsia, we should first endeavour, if possible, to ascertain the cause of the affection. It is a safe rule always to make an examination of the molar teeth, and to correct any irregularities that may be present by the use of the tooth-rasp, etc.

We must next pay attention to the quality and quantity of the food and to the time of feeding. Food must be suited to the requirements of the animal, while regularity in feeding is of the greatest importance. Long fasts are to be avoided, and a sufficient period of rest should be allowed after feeding. A proper allowance of pure water before feeding is also necessary. With regard to medicinal treatment no hard-and-fast rules can be laid down.

If there are evidences of excessive acidity, alkalies combined with bitter tonics are indicated, given after feeding or with the food. It is believed that excessive acidity in these cases often depends on acid formation in the undigested gastric contents.

We find a combination of bicarbonate of soda, tincture

of nux vomica, and gentian, administered in a pint of warm water three times a day after feeding, very beneficial in such cases (see formula, p. 432). This improves the appetite, assists digestion, and restores nerve-power to the gastric walls. In cases where the nervous mechanism of the stomach is at fault, we find the liquor strychninæ more certain in its results than nux vomica.

In nearly every instance it will be advisable to commence treatment with the administration of a purgative, and, unless there are indications to the contrary, a moderate dose of aloes, combined with calomel and gentian, should be prescribed, so as to clear out the alimentary canal.

We meet with cases in which the above treatment does not prove successful, and on changing to the mineral acids better results are obtained (see formula, p. 433). In these instances it is probable that there is a deficiency in the normal amount of acid in the gastric secretion.

The great difficulty in the treatment of dyspepsia is to ascertain the exact *cause* on which the affection depends; hence we must be prepared to meet cases of an obscure character, in which our resources are taxed in order to prescribe remedies that will prove beneficial.

If we are led to believe that chronic gastric catarrh is the cause of the dyspepsia, we must give the stomach as much rest as possible by allowing food in small quantities and of a nature that is easily digested.

Alkalies given in the intervals between feeding prove of marked value in these cases, a combination of bicarbonate of soda with light magnesia giving good results.

We must remember that chronic gastric catarrh may be associated with certain affections of the liver, in which the portal circulation is interfered with, the blood being driven back in the gastric bloodvessels.

Some authorities believe that the presence of the larvæ of the *Æstrus equi* in large numbers may induce chronic gastric catarrh by continued irritation.

We may remark that in all cases of gastric derangements a plentiful supply of water should be allowed, as a deficiency

in this respect is too often permitted. Rock-salt should also be placed in the manger, and a judicious amount of roots, green meat, etc., allowed. The salts of iron are frequently prescribed in a routine manner in cases of dyspepsia, but in our experience they are not indicated, and are likely to increase the existing irritation and to interfere with digestion. If the bowels do not act in a normal manner, Epsom salt should be given in the drinking-water. In the treatment of dyspepsia in the young animal, we find it necessary to pay attention to the general health of the dam, to see that she is properly fed and not overworked, and to insure that the foal is allowed to suck her at proper intervals.

It is of advantage to administer alkalies to the dam, such as the bicarbonate of soda twice daily. This subject will be again referred to under the heading of 'Diarrhœa' (see p. 470).

The Treatment of Gastric Impaction, or Indigestion with Engorgement of the Stomach.

The stomach of the horse may become distended either with solid ingesta or with gases arising from fermenting food, or a combination of both these conditions may be present. Clinically, it is often difficult to differentiate these affections. In gastric impaction the stomach is distended with a solid mass of fermenting ingesta; the walls of the organ become paralysed, digestion is arrested, and the gastric contents cannot pass beyond the pylorus.

As the horse is unable to perform the act of vomiting, relief is impossible by this means. Fatal results are apt to occur from rupture of the stomach or from cerebral complications.

The most frequent source of gastric impaction is feeding on boiled foods, such as barley, wheat, etc., especially if the animal be unaccustomed to this form of diet, or has been fasting for some time and after hard work. This food is swallowed quickly, with but little mastication, and under the conditions mentioned gastric distension is apt to occur.

The usual symptoms observed are a combination of those attributable to the stomach and to the cerebrum, the latter being probably of a reflex nature. These are as follows: Dull persistent pain, pawing, sweating in patches, restlessness, slight tympanites, a sleepy appearance, a tendency to push the head against surrounding objects, a staggering gait. In some cases stertorous breathing is present, and tremors of the superficial muscles, especially those of the scapular region.

Occasionally attempts at vomition may occur, and a discharge of liquid ingesta from the nostrils or eructations of gas may be observed.

In some cases symptoms of abdominal pain may predominate, in others these are masked by cerebral manifestations.

If the condition is unrelieved, either rupture of the stomach may occur or death may result from convulsions and coma.

The indications for treatment in gastric impaction are:

1. To get rid of the mass of fermenting ingesta from the stomach.

2. To restore nerve tone to the gastric walls.

For the first indication an aloetic ball is advised by some authorities. This in cases where the impaction is not severe may prove successful, but if otherwise, the physic fails to act, as it does not get beyond the stomach, the walls of which are in a paralysed condition, neither does it exert any action on the gastric contents. Hence we prefer a full dose of raw linseed-oil combined with calomel and oil of turpentine, as this is more likely to act on the ingesta in the stomach and to carry them into the intestine. A combination of calomel 2 drachms, oil of turpentine 4 ounces, and raw linseed-oil 2 pints, has in our hands proved of marked value. This may be followed up in a few hours with nux vomica and carbonate of ammonia, or aromatic spirit of ammonia. Two ounces of tincture of nux vomica with 2 ounces of aromatic spirit of ammonia may be given with another pint of raw linseed-oil.

If pain be a prominent symptom, 1 ounce of chloral hydrate should be given in solution, well diluted with mucilage, so as to avoid irritating the mouth.

Sulphuric ether is advised by some practitioners for this condition. Opiates in any form should not be given, as they interfere with peristaltic action, and tend to increase the paralysed condition of the stomach. If the bowels fail to act within a reasonable time, the oil may be repeated, and copious enemata of warm water should be administered.

Should cerebral symptoms predominate, evidenced by excitement and convulsive struggling, full doses of chloral hydrate with potassium bromide should be given, and a large dose of aloes in solution combined with calomel is indicated. In such instances active purgation is of the greatest importance. In cases where a sleepy condition is present, with a staggering gait, nerve sedatives are not indicated. These symptoms usually disappear when the gastric impaction is relieved.

The attendant should be instructed to prevent the horse from rolling, as this is believed to be a factor in the production of rupture of the stomach.

If we are fortunate enough to relieve the impaction of the stomach, great care must be exercised with reference to diet. Light food, easy of digestion and in small amounts at a time, should be allowed. In severe cases it is advisable to limit the diet to oatmeal-gruel and linseed-gruel for a few days. Gastric catarrh in varying degree and deficient nerve-power in the gastric walls may remain as a sequel to this affection.

Alkalies, nerve tonics, and vegetable bitters are indicated for the treatment of these conditions, and a combination of *nux vomica*, bicarbonate of soda, and gentian or calumba proves useful (see formula, p. 434). This may preferably be given in the food. If, however, the animal's appetite is poor, it must be administered in the form of bolus or drench.

The preventive measures to be adopted in connection with gastric impaction are to avoid boiled foods and long fasts, and to insure regular hours for feeding. For animals that tend to bolt their food, chopped hay should be mixed with

the oats, and the molar teeth should be examined, in order to detect any irregularities that may require surgical attention.

We may remark that extensive impaction of the stomach may be present in some cases without producing symptoms that would lead us to diagnose this condition. The extent to which this organ may become impacted without rupturing is remarkable at times.

The Treatment of Acute Gastric Tympany.

Distension of the stomach with gases, the result of fermentation of the ingesta, is not so commonly met with as other affections of this organ. It is of sufficient frequency, however, to merit a consideration in these pages, its serious nature demanding prompt and effectual treatment. A differential diagnosis is by no means easy, and the affection may be mistaken for one of a fatal character unless care be exercised.

The early symptoms may be deceptive, consisting of dull abdominal pain and a varying degree of tympanites. This is followed by fits of violent pain, great respiratory distress, profuse sweating, and a tendency to move about the stall in a semi-delirious manner. Slight eructations of gas may occur from the nostrils, with sometimes a slight trickling of fluid ingesta.

A symptom which is very frequently present is the peculiar posture assumed by the animal of sitting on the haunches, like a dog. This appears to give temporary relief, and is frequently adopted during the course of the disease. It must be recollected, however, that this may be a symptom of other abdominal lesions—*e.g.*, rupture of the intestine and intestinal calculus. Lying on the sternum with the fore-limbs extended is another posture frequently observed in gastric tympany.

We may mention that it is very difficult, if not impossible, in some cases to distinguish between gastric tympany and twist of the double colon. In the latter affection there will be present graver alterations in the character of the pulse and a deeper injection of the visible mucous membranes;

but in arriving at a diagnosis tact and discrimination are necessary, as the prominent symptoms may be common to either affection.

In the treatment of gastric tympany it is clear that we have two indications to fulfil—viz., to get rid of the accumulated gases from the stomach, and to prevent them from recurring. It is also necessary to restore nerve-power to the walls of the stomach and to get rid of the gastric contents. For these purposes we have found that a drench composed of 4 ounces each of oil of turpentine and aromatic spirit of ammonia, well shaken up in 2 pints of raw linseed-oil, gives good results. This may be repeated, if necessary, in two or three hours, giving half the above doses. Pure terebene is preferred by some to the oil of turpentine. Favourable symptoms are the occurrence of eructations of gas by the nostrils and the passage of flatus *per anum*.

Sedatives, such as opium or its preparations, should on no account be given, as they tend to increase the existing paralysis of the gastric walls.

We meet with cases where the agents we have recommended produce no beneficial results; eructations of gas are absent, and the stomach being distended to an enormous extent, presses on the diaphragm, causing alarming respiratory distress, the general condition of the animal showing marked prostration; the case terminating in death from exhaustion or from rupture of the stomach.

In such instances, Mr. H. Caulton Reeks, F.R.C.V.S., Spalding, in his work entitled 'The Common Colics of the Horse,' recommends a mixture of hydrate of iron and solution of hydrate of ammonia, prepared by mixing 1 ounce of sulphate of iron with $\frac{1}{2}$ ounce of liquor ammoniæ fort., in 2 pints of hot water. This mixture, with its precipitate of hydrate of iron, is to be given immediately. He mentions that the chief gases present in the distended stomach are carbonic acid, carburetted hydrogen, sulphuretted hydrogen, and a small proportion of nitrogen, and considers that the use of carbonate of ammonia would be contra-indicated for the following reason: The contents of the stomach being acid, would

so act on the carbonate of ammonia as to cause the evolution of carbonic acid gas, which would increase the amount of that gas already present. By the use of the agents advised, the solution of hydrate of ammonia will absorb the carbonic acid gas, and form carbonate of ammonia, while the freshly precipitated hydrate of iron combines with the sulphuretted hydrogen. He advises this treatment to be followed up with the administration of terebene or oil of turpentine, in order to prevent further fermentation occurring in the stomach, and recommends the hypodermic injection of eserine sulphate, in order to stimulate energetic intestinal movements, and thus tend to overcome the spasmodic contraction of the pyloric orifice of the stomach that is present in cases of gastric tympany (see formulæ, p. 434).

It is of the greatest importance in the treatment of this condition to prevent the animal from rolling or throwing himself about, as by such movements there is grave risk of rupture of the stomach being produced.

During convalescence, the stomach should get as much rest as possible by allowing soft, easily-digested foods, in small amounts. Nerve tonics and alkalies similar to those advised during convalescence from gastric impaction may be given.

FORMULÆ FOR HORSES.

Purgative Ball in the Treatment of Dyspepsia.

R Aloes Barb. ...	...	...	̄iv.
Hydrarg. subchlor. ...	...	...	̄ss.
Pulv. gentianæ ...	...	...	̄i. ss.
Ol. menthæ pip. ...	...	...	℥ v.
Excipient ...	...	...	q.s.
F. bol. i.			

Tonic Alkaline Mixture in Dyspepsia.

R Tinct. nucis vom. ...	...	...	̄ii. ss.
Sodii bicarb. ...	...	...	̄iii.
Tinct. gent. co. ...	...	...	̄v.
Spts. ammon. aromat. ...	...	...	̄iii.
Aquæ ...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a pint of warm water, after feeding.

Tonic Alkaline Powders in Dyspepsia.

R	Sodii bicarb. ...	...	...	̄i.iii.
	Pulv. nucis vom. ...	...	...	̄i.ii.
	Pulv. gentianæ ...	...	...	̄i.ss.
	Pulv. anisi ...	...	...	̄i.ii.

M Div. in pulv. vi. Sig. : Give one twice a day in the food.

Mixture to promote Appetite in Dyspepsia.

R	Liq. strychninæ ...	...	...	̄v.
	Tinct. cardamomi co. ...	...	...	̄v.
	Tinct. gentianæ co. ...	...	...	̄v.
	Aquæ ...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls three times a day in half a pint of water.

Acid Tonic Mixture for Dyspepsia.

R	Acidi nitro-hydrochlor. dil. ...	...	...	̄x.
	Liq. strychninæ ...	...	...	̄v.
	Tinct. gentianæ co. ...	...	...	̄v.
	Aquæ ...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls three times a day in half a pint of water, after feeding.

Laxative Powders for Dyspepsia.

R	Sodii sulph. exsicc ...	...	...	̄v.ss.
	Sodii bicarb. ...	...	...	̄i.ss.
	Sodii chlor. ...	...	...	̄iv.ss.

M. Div. in pulv. vi. Sig. : Give one twice a day, dissolved in the drinking-water.

Purgative Drench in Gastric Impaction.

R	Hydrarg. subchlor. ...	...	...	̄ii.
	Ol. terebinth. vel. terebeni ...	...	...	̄iv.
	Ol. lini ...	...	...	O.ii.

F. m. Sig. : Give at once.

R	Tinct. nucis vom. ...	...	...	̄ii.
	Spts. ammon. aromat. ...	...	...	̄ii.
	Ol. lini ...	...	...	O.i.

F. m. Sig. : To be given two hours after the above mixture.

Sedative Drench in case of Cerebral Excitement.

R	Chloral hyd.	...	...	...	℥i.
	Potassii bromidi	...	...	...	℥i.
	Mucilaginis	...	...	...	q.s.
	Aquæ...	...	...	...	℥i.

F. m. Sig.: Give in one dose. Repeat in two hours, if necessary.

Tonic Alkaline Powders during Convalescence.

R	Pulv. nucis vom.	...	...	...	℥vi.
	Sodii bicarb....	...	...	...	℥vi.
	Pulv. gentianæ	...	...	...	℥iii.
	Pulv. anisi	...	...	...	℥iii.

M. Div. in pulv. xii. Sig.: Give one twice a day in the food.

Drench for Acute Gastric Tympany.

R	Ol. terebinth. <i>vel</i> terebeni	...	...	...	℥iv.
	Spts. ammon. aromat.	...	...	...	℥iv.
	Ol. lini	...	...	...	℥ii.

M. Sig.: Give at once. Repeat in two hours, if necessary.

Anti-tympanitic Drench for Gastric Tympany.

R	Ferri sulph. pulv.	...	...	...	℥i.
	Liq. ammon. fort.	...	...	...	℥iv.
	Aquæ (ferv.)	...	...	...	℥ii.

F. m. Sig.: Administer at once. Shake mixture so as to include the resulting precipitate.

The above to be followed by :

R	Terebeni	...	...	...	℥ii.
	Ol. menth. pip.	...	...	...	℥i.
	Ol. lini	...	...	...	℥i. ss.

F. m. ... After this administer 2 grains of eserine hypodermically.

CHAPTER IV

THE TREATMENT OF DISEASES OF THE DIGESTIVE ORGANS (*continued*)

The Treatment of Acute and Chronic Gastritis in the Horse.

ACUTE gastritis is stated by some authorities to be a rare affection in the horse, except as the result of irritant poisons. Post-mortem evidence, however, would lead us to believe that it is of more frequent occurrence than is usually imagined, and we are safe in stating that in many cases the affection is not recognised, the symptoms being attributed to intestinal disorders. This is not surprising when we consider that the symptoms are neither constant nor diagnostic ; and we find it difficult to differentiate between this affection and diseases of the intestinal canal.

Pain, slow and continuous, pawing with alternate fore-feet, partial sweating, especially in the region of the shoulders, tremors of the superficial muscles of the same region, total loss of appetite, and a dull expression of countenance, are some of the symptoms to be observed in a case of acute gastritis. In some instances the pain will assume a more acute character, and the animal will frequently look towards the left side, and exhibit symptoms similar to those of spasmodic colic. In others purging may be a prominent symptom. Cerebral complications may ensue, the animal being unable to rise, struggling in a convulsive manner with fore and hind limbs, and showing all the symptoms of meningitis (see p. 549). The autopsy reveals the villous

mucous membrane of the stomach swollen, of a dark red colour, and covered with a layer of tenacious mucus, in which detached epithelial cells from the gastric mucosa are found. In very acute cases the submucous coat is œdematous in character.

The causes of acute gastritis in the horse, independent of direct irritants entering the stomach, are obscure. Errors of dieting and the existence of catarrhal fever have been suggested as causes, but in our experience it is often impossible to assign any cause for the affection. In some instances a number of cases occur at the same time, the autopsies revealing the lesions of gastritis and meningitis.

When the affection is complicated with meningitis it proves fatal in spite of all treatment, and the only agent which appears to give temporary relief is chloral hydrate; this should be administered in full doses, and repeated as required. In other cases, gastric sedatives are indicated in combination with antacids.

Treatment should be commenced by administering $1\frac{1}{2}$ pints of raw linseed-oil, in order to promote removal of irritating ingesta from the stomach. This should be followed up with belladonna, sodium bicarbonate, and bismuth, which may be repeated at intervals until pain is relieved (see formula, p. 442).

If the pain be very acute, 1 ounce of chloral hydrate may be given well diluted with milk and mucilage, so as to avoid its irritating effects on the mouth and stomach. This is far preferable to opium in any form, as the latter causes nausea, and tends to interfere with the peristaltic action of the gastrointestinal canal. The stomach should get as much rest as possible; no solid food should be allowed, but demulcent preparations, such as linseed-tea, well-boiled oatmeal-gruel and milk, may be given instead.

In gastritis due to the action of irritant poisons, demulcents, oil, linseed-tea, etc., may be given *ad lib.*; and we should endeavour to ascertain the nature of the poison, so as to administer suitable antidotes.

Toxic gastritis is to be suspected when, in addition to the

ordinary symptoms, we observe acute pain, extreme nausea, purging, salivation, and cold extremities. In some cases lesions of the mouth and tongue are present.

Chronic gastritis may occur as a sequel to an acute attack, or may be induced by continued chronic indigestion. It is very difficult, if not impossible, to differentiate chronic indigestion from chronic gastritis, as the former very often depends on the presence of the latter. The suitable treatment has already received attention under the heading of 'Dyspepsia' (see p. 417).

The Treatment of Gastric Affections in the Ox.

In consequence of anatomical and physiological peculiarities in the stomach of the ruminant as compared with that of the horse, we find there are special diseases of this organ that merit our attention.

We may mention that, while in the horse affections of the intestines are far more common than those of the stomach, in the ruminant the opposite is the case, as the stomach in this species is complicated in its arrangement, and takes a very important part in the preparation of the food for the process of digestion.

Impaction of the rumen depends on an accumulation of solid ingesta in this organ. It is recognised by a distended condition of the left flank; the swelling is dough-like in character, and when pressed on, the imprint of the fingers remains on the part. The walls of the rumen become paralysed, and rumination is suspended.

The indications for treatment are to get rid of the ingesta, to restore tone to the walls of the organ, and to prevent a recurrence of the condition by attention to diet. A full dose of sulphate of magnesia should be administered in 4 pints of hot water and 2 pounds of treacle. This should be followed up by nux vomica, carbonate of ammonia, and gentian, administered in warm ale, and a liberal amount of treacle (see formula, p. 443). If the purgative fails to act, we prescribe 2 drachms of calomel, $\frac{1}{2}$ drachm of croton-oil, and 2 ounces of tincture of nux vomica, in 2 pints of raw linseed-oil.

Mustard in doses of from 1 to 2 ounces, combined with carbonate of ammonia and nux vomica, often proves useful in restoring nerve-power to the gastric walls (see formula, p. 443).

In severe cases medicines may have no effect, and the operation of *rumenotomy* must be performed, a description of which will be found in works on veterinary surgery.

The hypodermic injection of veratrine is advised by Continental authorities (see p. 239). Barium chloride is also recommended (see p. 117).

Gastric Tympanites, also known as hoven, is a very common affection in cattle. It consists of a distension of the rumen with gases arising from the fermentation of ingesta, such as fresh succulent clover, potatoes, frosted turnips, etc. The affection may also occur under a variety of conditions, such as choking or the presence of foreign bodies in the rumen or reticulum, etc.

Recurring attacks of gastric tympanites are met with in cases of derangement of any of the divisions of the stomach, and also in affections where rumination is suspended; in such instances we must regard it as a symptom.

Gastric tympanites is recognised by a distension of the left flank, which is tense and drum-like in character, and may assume very large proportions.

The respirations are accelerated in proportion to the extent of the distended organ, which presses on the diaphragm. The animal grunts or moans, and in severe cases there is great distress from dyspnœa. The indications for treatment are to neutralise and cause expulsion of the gases present, and to prevent them re-forming. For these purposes we administer from 2 to 4 ounces of oil of turpentine and 4 ounces aromatic spirit of ammonia in 2 pints of raw linseed-oil. This is to be followed up by the administration of 1 pound of sulphate of magnesia with 2 pounds of treacle in 4 pints of warm water, in order to clear out the gastro-intestinal canal. If relief be not obtained, we have found 2 ounces of carbonate of ammonia in 2 pints of warm ale prove efficacious.

In urgent cases, with marked distension and respiratory

distress, immediate relief must be given by the use of the trocar and cannula inserted in the left flank.* This procedure permits the gases to escape, and the medicinal treatment as already indicated should then be carried out.

Some cases of gastric tympanites are very obstinate, and the affection recurs at intervals. The cause is usually either the presence of foreign bodies in the rumen or reticulum or the existence of chronic indigestion.

A correct diagnosis is very difficult; if the cause be the presence of foreign bodies in the organ, medicinal treatment can be of no avail, and rumenotomy must be performed. If depending on indigestion, suitable remedies should be employed. The administration of antiseptics such as carbolic acid or cyllin gives good results in some of these cases.

The omasum, or third division of the stomach, is believed by some authorities to suffer from impaction, termed 'fardel-bound,' and symptoms are described to indicate the presence of this condition.

Other authorities state that the symptoms in reality depend on inflammation of the abomasum or true digestive division of the stomach, the impaction of the omasum resulting from its functions being interfered with.

Our experience is in accordance with the latter view, so we shall proceed to notice the treatment of gastritis or inflammation of the abomasum.

Acute Gastritis.

In the ruminant, acute gastritis is usually accompanied by cerebral complications, evidenced either by a delirious condition or by a tendency to a comatose state. A staggering gait may be observed in some instances; the head may be pressed against solid objects; the animal becomes unable to stand, and paralysis supervenes.

Diarrhœa may be an early symptom, succeeded by obstinate constipation; the animal grunts or moans at intervals, appetite is completely lost, and rumination is

* For details of this operation consult works on veterinary surgery.

suspended, while tympanites in varying degree is frequently present. In some cases blood and mucus may be passed with a small amount of hard dry fæces.

Gastritis in cattle is a serious and often a fatal affection, especially if treated in an irrational manner by large doses of purgatives.

With reference to treatment, at the outset a moderate purgative will be of advantage, so we prescribe 2 drachms of calomel with a quart of raw linseed-oil. This is to be followed up by the administration of belladonna, bicarbonate of soda, and nux vomica.

For a full-sized cow we have found that 2 drachms of extract of belladonna, 1 ounce of bicarbonate of soda, and 1 ounce of tincture of nux vomica, given in a pint of linseed-tea and 1 pound of treacle every four hours, proves very useful. If stimulants are indicated, we prescribe ale in quantities according to the degree of exhaustion present. We allow bran-water, linseed-tea, oatmeal-gruel, etc., but avoid forcing food of any kind on the animal.

When the acute symptoms have subsided we discontinue the belladonna, and prescribe the bicarbonate of soda and nux vomica in smaller doses. Attention to the food is of great importance, and as gastritis is usually due to dietetic causes, we must take precautions to avoid a recurrence of the attack.

We meet with cases of subacute gastritis in cattle in which cerebral complications are absent. The symptoms are total loss of appetite, obstinate constipation, cessation of rumination, a frequent grunt or moan, and recurring attacks of tympanites. In such cases we find it advisable to administer a moderate dose of sulphate of magnesia with treacle, and to follow this up with nux vomica, bicarbonate of soda, and gentian in warm ale. Strong and repeated doses of purgatives are not only useless, but may cause a fatal termination.

The object to be attained is to restore the stomach to its normal condition; the intestines will then resume their functions. If the above treatment fails to bring about an action of the bowels, we prescribe raw linseed-oil in full

doses. We also continue the medicinal agents mentioned, with the addition of carbonate of ammonia, and administer 1 pound of treacle with each dose.

Parasitic Gastritis occurs in calves and lambs, and depends on the presence of minute nematode worms in the mucous membrane of the abomasum. These cause irritation of the mucous membrane, with gastritis and anæmia as a result.

The symptoms observed are constant diarrhœa, emaciation, thirst, and debility.

Experiments have proved that the ordinary vermicides have little or no effect on these parasites, but that lysol in 1 per cent. solutions is capable of destroying them. Creasote of a similar strength is also recommended.

It cannot be said that success has been achieved with any form of treatment up to the present.

Indigestion, or Dyspepsia, is of frequent occurrence in cattle. It is probably the abomasum that is affected, in a similar manner to that already described as occurring in the horse; as a result, the functions of the other divisions of the stomach are interfered with.

Irregular appetite, loss of condition, recurring attacks of slight tympanites, an unhealthy condition of the skin, and irregular action of the intestines, are symptoms that are observed in this condition.

We frequently meet with cases in cattle characterised by a staggering gait, interference with vision, a tendency to press the head against surrounding objects, or to elevate it in a peculiar manner. These we must ascribe to some form of indigestion, as after the administration of a saline cathartic resulting in free purgation, the symptoms disappear. Such cases are sometimes described as 'grass staggers,' and are attributed to some toxic influence from the ingestion of rye-grass; but as we meet them in the absence of the latter form of food, we are inclined to the belief that feeding on any indigestible grasses may produce this condition.

The treatment of indigestion in cattle consists in administering a full dose of sulphate of magnesia, and in

limiting the amount of food, besides giving a change of diet. Follow up with nux vomica, gentian, and bicarbonate of soda, given three times a day in ale; allow rock-salt within reach of the animal, and see that a liberal supply of water is at hand.

We must refer briefly to a form of indigestion met with in young calves, depending on the milk curdling in the abomasum, and forming hard masses therein. The cause of this condition is often obscure. Irregularity of feeding or an excessive amount of milk may produce it.

Gastritis and enteritis may result, the affection proving fatal in many instances. We have found good results from the addition of lime-water or bicarbonate of soda to the milk, attention to the quantity and quality of the latter, and the administration of a moderate dose of castor-oil, followed by antacids and stomachics. If gastro-enteritis supervenes, opiates will be indicated, but in such a case treatment is of little avail.

FORMULÆ.

Mixture for Gastritis in the Horse.

R	Ext. belladonnæ vir.	...	...	̄v.
	Bismuthi carb.	...	...	̄ii.
	Sodii bicarb.	...	...	̄ii.
	Mucilaginis	...	...	̄ii.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours in a pint of linseed-tea until relief is obtained.

Anodyne Drench for Gastritis.

R	Chloral hyd.	...	...	̄i.
	Mucilaginis	...	...	̄iv.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give at once. Repeat in three hours if necessary.

Tonic Alkaline Mixture during Convalescence from Gastritis.

R	Sodii bicarb.	...	...	̄i.ss.
	Tinct. nucis vom.	...	...	̄x.
	Tinct. gentianæ co.	...	...	̄v.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a pint of linseed-tea.

Laxative Powders for Same when such are required.

R Mag. sulph. ℥xii.
Sodii bicarb. ℥ii.

M. Div. in pulv. vi. Sig.: Give one twice a day dissolved in the drinking-water.

Drench for Impaction of the Rumen in Cattle.

R Magnesii sulph. lb.i.
Sodii chlor. lb.ss.
Pulv. zingib. ℥i.

M. Sig.: Give at once, dissolved in 4 pints of warm water and 2 pounds of treacle.

In two hours give the following:

R Pulv. nucis vom. ℥iv.
Ammonii carb. ℥i.
Pulv. anisi ℥i.
Pulv. gentianæ ℥i.

M. F. pulv. i. Sig.: Give in 2 pints of warm ale and 2 pounds of treacle. Repeat in three hours if necessary.

Drench to be given in case the Purgative fails to Act.

R Ol. crotonis ℥ss.
Hydrarg. subchlor. ℥ii.
Tinct. nucis vom. ℥ii.
Ol. lini O.ii.
F. m.

Powders to restore Nerve Tone to the Rumen.

R Ammon. carb. ℥iii.
Pulv. nucis vom. ℥ii.
Pulv. gentianæ ℥vi.
Pulv. anisi ℥vi.
Pulv. sinapis ℥vi.

M. Div. in pulv. vi. Sig.: Give one three times a day in a pint of warm ale.

Drench for Gastric Tympanites or Hoven in Cattle.

R Ol. terebinth. ℥iv.
Spts. ammon. aromat. ℥iv.
Ol. lini O.ii.

F. m. Sig.: Give at once.

To be followed by :

R	Mag. sulph.	...	...	...	lb.i.
	Pulv. nucis vom.	...	...	...	℥ii.
	Pulv. zingib.	...	...	...	℥i.

M. Sig. : Give in 4 pints of warm water and 1 pound of treacle.

If the tympanites tends to recur, give the following :

R	Ammonii carb.	...	...	...	℥i.
	Pulv. nucis vom.	...	...	...	℥ii.
	Pulv. sinapis.	...	...	...	℥i.
	Pulv. anisi	...	...	...	℥i.

F. pulv. i. Sig. : Give in a quart of warm ale. Repeat in three hours if necessary.

Or :

R	Cyllin	...	...	...	℥iv.
	Terebeni	...	...	...	℥iv.
	Ol. lini	...	...	...	O.i.
	F. m.				

Mixture for Acute Gastritis in Cattle.

R	Ext. belladonnæ vir.	...	...	...	℥x.
	Tinct. nucis vom.	...	...	...	℥v.
	Sodii bicarb.	...	...	...	℥v.
	Aquæ	...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every three or four hours (according to the severity of the case) in a pint of linseed-tea and a pound of treacle.

If the pain be acute, the following may be given :

R	Chlorodynii	...	...	...	℥ii.
	Spts. chloroformi	...	...	...	℥ii.
	Ol. lini	...	...	...	O.i.

F. m. Sig. : Give at once. Repeat in two hours if necessary.

Tonic Alkaline Powders to be given during Convalescence from Gastritis.

R	Ammonii carb.	...	...	...	℥ii.
	Sodii bicarb.	...	...	...	℥iii.
	Pulv. nucis vom.	...	...	...	℥i.ss.
	Pulv. gentianæ	...	...	...	℥iii.
	Pulv. carui sem.	...	...	...	℥iv.

M. Div. in pulv. vi. Sig. : Give one three times a day in a pint of linseed-tea.

CHAPTER V

THE TREATMENT OF GASTRIC AFFECTIONS IN THE DOG

IN canine practice gastric affections are very commonly met with. Overfeeding and want of exercise may be credited as the chief factors in the production of these disorders in the dog.

Gastritis may be either acute or chronic, and is of very frequent occurrence.

Acute gastritis may arise from the presence of irritating ingesta or decomposed meat in the stomach, and also from the effects of irritant poisons. The facility with which the act of vomiting occurs in the dog no doubt prevents many attacks of gastritis, which would otherwise result from engorgement of the stomach if the ingesta were not got rid of in this manner.

In our experience, some of the most acute cases of gastritis have been due to the ingestion of decomposing meat or fish, a form of ptomaine poisoning being induced, and enteritis occurring as a complication. In canine typhus, gastritis is one of the prominent lesions.

The symptoms of acute gastritis are persistent vomiting, a frothy mucus being expelled in large quantities. In some cases the latter may be streaked with blood. Both liquids and solids are rejected from the stomach; the thirst is excessive, and the animal drinks large quantities of water, which are quickly vomited again. Exhaustion is extreme, and the countenance shows a haggard expression. Various attitudes may be assumed by the patient in order to seek relief from the continuous pain that is present. In severe

cases cerebral symptoms may supervene ; the animal becomes very irritable, and may attempt to bite on being handled. Convulsions may be present, and in some instances paralysis of the posterior extremities results. Such cases are sometimes mistaken for rabies, and great discrimination is necessary in order to avoid an erroneous diagnosis.

We meet with subacute cases of gastric catarrh, in which vomiting, thirst, constipation, and entire loss of appetite, are the leading symptoms.

In the treatment of gastritis, the greatest difficulty we have to overcome is to control the excessive vomiting that is present. Foods of all kinds are rejected by the stomach, and exhaustion is a leading feature. Gastric sedatives and antacids are indicated, with small doses of an opiate if the pain be acute. A combination of bismuth, hydrocyanic acid, and bicarbonate of soda, with a solution of opium, such as Battley's *Liq. opii sed.*, will be found very useful in such cases. Small doses should be given at intervals, and the opiate should be omitted when pain is relieved. Hot fomentations to the abdomen are also useful, while the diet should be restricted to milk and lime-water. In cases where the above treatment fails to arrest the vomiting, we find that chloretone proves very effectual. It may be given in the form of powder, placed on the back of the tongue, and washed down with a little water, the usual dose being 5 grains, repeated every two hours. We have found this agent to succeed when all others have failed. Nutritive enemata should also be employed.

If all food is persistently rejected, we find that Brand's Essence of Beef, given in small amounts, may be kept on the stomach when other forms of food fail in this respect. In less acute cases we find it advisable to commence treatment with the administration of a moderate dose of calomel given in tabloid form, or of mercury with chalk. A mixture of bismuth, bicarbonate of soda, and *nux vomica*, may then be prescribed every four hours.

Attention to the diet is of first importance. All solid food must be withheld, and milk with lime-water should be

allowed. In cases recovering from gastritis, care must be taken with reference to feeding, and the stomach should get as much rest as possible. Light, easily-digested articles of food, allowed at short intervals and in small amounts, should be ordered. It will be of advantage in convalescent cases to add a bitter stoinachic to the antacid mixture, such as the compound tincture of gentian or tincture of calumba.

While careful nursing is of the greatest importance in the treatment of gastritis, the patient should not be annoyed by the too frequent forcing of either food or medicines on him. Small quantities of port wine are useful when marked prostration is present, but if rejected by the stomach they should not be persisted in.

In the treatment of *chronic gastritis* in the dog, we follow out similar lines to those already mentioned when dealing with this affection in the horse. Recognising the fact that improper feeding, as regards both quantity and quality of the food, is the chief factor in the causation of this condition, we commence treatment by directing our attention to the diet. We next clear out the alimentary canal by administering a dose of calomel and extract of colocynth in pill form. A stomachic mixture, containing bicarbonate of soda, tincture of nux vomica, and compound tincture of gentian, given three times daily, gives good results. No hard-and-fast rule can be laid down in the treatment, as we find it impossible in the majority of cases to distinguish chronic gastritis from the condition known as dyspepsia or indigestion. Careful observation will enable us to prescribe suitable remedies in each case, and to ascertain the form of food that is likely to suit the patient.

Dyspepsia, or **Indigestion**, is a very common ailment in house-dogs. Foul breath, loss of condition, irregular appetite, a desire to eat dirt and excreta, occasional vomiting, thirst, and a tendency to diarrhœa after feeding, are some of the symptoms observed in this condition. Constipation is present in some cases.

The treatment consists in administering a dose of calomel, with which may be combined the compound colocynth pill, the quantity depending on the size of the animal. An

alkaline stomachic mixture may be given three times daily. The food must be regulated, and the animal prevented from indulging his appetite. The usual course for a house-dog is to eat whenever opportunity offers, hence the stomach seldom obtains any rest. This is totally opposed to the natural state of the animal.

Engorgement of the Stomach is seldom seen in the dog, in consequence of the facility with which the act of vomition is performed by this animal. In his natural state the dog suffering from gastric engorgement seeks a variety of grass—the *Agropyrum repens*, or couch-grass—the ingestion of which acts as an emetic and relieves the stomach. The temporary degree of nausea that remains prevents a recurrence of the disorder mentioned.

When a case is brought for treatment with a history of the animal having gorged himself, the first indication is to administer an emetic, such as half a teaspoonful of bicarbonate of soda with a little common salt in a wineglassful of lukewarm water, or from one to two teaspoonfuls of ipecacuanha wine may be given for a similar purpose. After the emetic has acted a purgative should be given, such as calomel combined with compound pill of colocynth and hyoscyamus, in a dose varying according to the size of the dog. Solid food must be withheld, and the diet should consist of milk combined with lime-water until the animal is convalescent.

Foreign Bodies in the stomach give rise to a variety of symptoms, and in the absence of a correct history of the case diagnosis is attended with considerable difficulty. Cerebral symptoms may present themselves, consisting of fits of convulsions, a change in the demeanour of the animal, etc. Puppies are especially liable to swallow foreign bodies in consequence of their playful habits.

If we receive a history that a patient has been seen to swallow a foreign body, and if the latter, from its size or shape, cannot with safety pass through the gastro-intestinal canal, laparotomy should be performed as soon as possible, and the foreign body removed from the stomach. The details of this operation will be found in works on veterinary

surgery.* If the foreign body be small and smooth, the patient should be fed on boiled rice, and as little fluids allowed as possible. In a variable period the foreign body will be passed with the fæces.

In the diagnosis of these conditions the use of radiography is likely to prove of great assistance.

FORMULÆ.

Mixture for Acute Gastritis in the Dog.

R Bismuthi carb.	...	...	̄i.
Liq. opii sed.	...	...	̄ss.
Acidi hydrocyanici (B.P.)	...	...	℥ xviii.
Sodii bicarb.	...	...	̄i.
Mucilaginis tragacanthæ	...	...	̄i.
Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to two table-spoonfuls (according to the size of the dog) every three or four hours.†

Or, if vomiting be excessive:

R Chloretone grs. v. to gr. x.

F. pulv. i. Sig.: Place on the back of the tongue, and wash down with a little water. Repeat every two hours until vomiting is relieved.

Tonic Alkaline Mixture during Convalescence from Gastritis.

R Sodii bicarb.	...	...	̄i.
Liq. bismuthi (B.P.)	...	...	̄i.ss.
Tinct. nucis vom.	...	...	̄i.
Syr. aurantii	...	...	̄i.
Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful (according to the size of the dog) three or four times daily.

* Consult 'Surgical Diseases of the Dog and Cat,' by Professor Hobday, F.R.C.V.S.

† N.B.—In the formulæ for dogs throughout the text, the doses advised are those suitable for a dog from the size of a fox-terrier upwards. For smaller animals, and for the toy breeds, from one-half to one-quarter of these doses will be sufficient. The doses must also be modified according to the requirements of the case.

Mixture for Cases in which the Gastric Secretion is Defective.

R	Acidi hydrochlorici dil.	...	...	̄i.
	Pepsini	...	...	grs. xl.
	Syr. aurantii	...	...	̄i.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day after feeding.

Purgative Pills in Cases of Chronic Gastric Catarrh.

R	Pilulæ colocynthidis et hyos-			
	cyami	...	...	grs. iv. to grs. vi.
	Hydrarg. subchloridi	...	...	gr. i. to grs. ii.

F. pil. i. Sig.: Give at once. The doses must be graduated according to the size of the dog.

Alkaline Mixture in Chronic Gastric Catarrh.

R	Sodii bicarb.	...	...	̄ii.
	Tinct. nucis vom.	...	...	̄i.
	Tinct. gentianæ co.	...	...	̄iv.
	Syr. aurantii	...	...	̄i.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

Mixture for Atonic Dyspepsia.

R	Sodii bicarb.	...	...	̄i.
	Tinct. nucis vom.	...	...	̄i.
	Tinct. calumbæ	...	...	̄iii.
	Spts. ammon. aromat.	...	...	̄iii.
	Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

Mixture for Dyspepsia accompanied by Acidity and Flatulence after Feeding.

R	Tinct. rhei	...	...	̄vi.
	Sodii bicarb.	...	...	̄i.
	Magnesii carb.	...	...	̄i.
	Spts. ammon. aromat.	...	...	̄iii.
	Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful as required.

Bismuth Mixture in Cases of Acid Flatulent Dyspepsia.

R	Liq. bismuthi (B.P.)	...	...	℥vi.
	Sodii bicarb.	...	...	℥i.
	Spts. chloroformi	...	...	℥ii.
	Aq. menth. pip.	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

Alkaline Tonic Mixture in Chronic Gastric Catarrh.

R	Sodii bicarb.	...	...	℥iii.
	Tinct. nucis vom.	...	...	℥i.
	Spts. ammon. aromat.	...	...	℥ii.
	Aquæ	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

Tonic Mixture in Dyspepsia.

R	Liq. strychninæ	...	...	℥xxxvi.
	Acidi nitro-hydrochlor. dil.	...	...	℥ii.
	Syr. aurantii...	...	...	℥ss.
	Aquæ chloroformi	...	...	ad ℥vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times a day.

CHAPTER VI

THE TREATMENT OF DISEASES AND DISORDERS OF THE INTESTINES IN THE HORSE

INTESTINAL affections are of very common occurrence in the horse, hence their treatment is a subject of great importance to the therapist. Some of these diseases are simple in their nature, and tend to a speedy recovery; others depend on serious lesions, and are usually fatal in their results. Clinical experience teaches us that it is difficult, if not impossible, in many of these cases to arrive at a correct diagnosis. Attempts have been made from time to time to discover diagnostic symptoms for each condition, but further experience has demonstrated how fallacious have been the conclusions arrived at.

A consideration of the leading symptoms—viz., the character of pain, the degree of tympanites, the amount of constitutional disturbance present, the condition of the pulse, etc.—may lead us to suspect the nature of the case; but if we compare our observations made during life with the results of autopsies, we shall find that it is the exception rather than the rule to make a correct diagnosis in cases of this kind.

We shall first consider those affections which do not depend on the presence of organic changes in the intestinal walls.

Simple Spasmodic Colic is an affection of very frequent occurrence. Various causes have been assigned for it. In many instances no appreciable cause can be discovered,

while we meet with a number of cases that recover without any treatment. The affection is believed to depend on a spasmodic contraction of the muscular coat of either the small or large intestines, the presence of irritating ingesta being an important factor in its production.

A fertile source of repeated attacks of spasmodic colic is chronic indigestion. In this condition the food passes into the intestinal canal before it has been properly subjected to gastric digestion, hence it is not in a fit state for intestinal digestion, and acts as an irritant. The symptoms of ordinary spasmodic colic are pawing, kicking at the belly, rolling, looking at the flanks, etc. The pain occurs in paroxysms, during which accelerated respirations and a frequent pulse are observed. These, however, return to the normal during the intervals of ease. The absence of constitutional disturbance and the intermittent character of the pain may enable us to differentiate spasmodic colic from more serious conditions; but as symptoms of this character may be present at the commencement of what afterwards proves to be a grave intestinal affection, a guarded diagnosis and prognosis should always be given in such cases.

In reality colicky pains are symptoms which are met with in various forms of abdominal affections, such as gastritis, colic depending on impaction of the intestine, etc. They may also be present in some forms of renal and hepatic affections and in azoturia; while in the first stages of pleurisy similar pain is manifested; thus, great discrimination is necessary in order to ascribe it to its proper location.

It is a disputed point whether unrelieved cases of spasmodic colic terminate in enteritis, or whether the latter always arises as a separate and distinct affection. We doubt very much whether ordinary spasmodic colic *per se* ever terminates fatally, and we must admit that we know very little of the exact condition of the intestinal canal that gives rise to the familiar symptoms of this affection.

In the treatment of spasmodic colic a great diversity of opinion exists. Some authorities, believing that the affection depends on the presence of irritating ingesta in the intestinal

canal, advise the administration of a purgative such as aloes, in order to clear out the bowels and thus remove the cause. They state that opium or its preparations are contra-indicated, as such drugs interfere with the peristaltic action of the intestines, and thus cause retention of the irritating ingesta, leading to impaction of the colon and serious results. Others, fearing that the symptoms of abdominal pain may be evidences of the commencement of an attack of enteritis, and being aware of the difficulties in the diagnosis of abdominal affections, prefer to administer an opiate to relieve the pain, along with an oleaginous laxative such as raw linseed-oil.

A large number of cases of ordinary spasmodic colic recover without any treatment. It is no uncommon circumstance for the practitioner to be called in haste to attend a case of this description, and on arrival to find the animal free from pain and perfectly well. The administration of a diffusible stimulant, such as 2 ounces of aromatic spirits of ammonia in warm water, gives relief in many cases. Of course, if the pain is severe and continuous it is necessary to adopt measures for its relief, and the least harmful drug for this purpose is chloral hydrate, administered in a dose of 1 ounce, well diluted with mucilage and water, so as to prevent its irritating effect on the mouth and tongue.

Chloral hydrate possesses marked advantages over opium or its preparations for the relief of abdominal pain. It does not interfere with the peristaltic action of the intestines, neither does it tend to cause retention of irritating ingesta. We know from experience that in cases of prolonged and severe abdominal pain, repeated doses of opium or its preparations fail to give relief, and produce excitation of the motor centres, evidenced by the animal walking in a circular direction. We are also aware of the marked constipation and the extreme nausea induced by opiates.

For these reasons many practitioners have abandoned the employment of opium in any form in the treatment of cases of abdominal pain, and find chloral hydrate far preferable for this purpose. There are many objections to the employ-

ment of aloes in the treatment of spasmodic colic. Recognising the difficulties of diagnosis, we must remember that the symptoms of pain presented to us may depend on a more serious condition than simple colic, when aloes would be contra-indicated. Again, this drug takes a considerable time to act, and, if administered to cases of simple colic, it means that the animals cannot work for a few days, which in cart-horses would entail a considerable loss.

No hard-and-fast rule can be laid down in the treatment of the affection under consideration. As previously remarked, there are many cases in which the only treatment required is the administration of a diffusible stimulant. The advisability of prescribing an anodyne will depend on the severity of the pain and its duration, and must rest with the discretion of the practitioner.

We meet with many cases of prolonged colic, in which severe pain is present, that recover without further complications. Of course, in such instances a correct diagnosis is almost impossible. Very frequently, however, such cases prove to be a condition of obstruction of the double colon, from the presence of irritating ingesta. The pain may vary in character from acute to dull, and special treatment is indicated (see p. 457).

We may add that the practice of administering opiates in ordinary colic cases tends to bring about this condition by inducing paralysis of the intestines and retention of their contents.

It is generally advisable to administer a dose of raw linseed-oil in the treatment of spasmodic colic, so as to assist Nature in getting rid of irritating ingesta from the intestines. Enemata of warm water should be given, with a similar object in view.

After-treatment is of importance, and no solid food should be given until the following day, oatmeal and linseed-gruel being allowed instead. In cases of recurring attacks of colic, attention should be directed to the feeding and to the general management of the animal, while the teeth should be examined, and should receive surgical treatment if necessary

The Treatment of Flatulent Colic.

In this affection the large intestines become distended with gases, arising as a rule from fermentation of the ingesta. There are various degrees of this distension, and if severe it is attended by considerable danger to life unless relief be prompt, as asphyxia or rupture of the intestine may result. Tympanites of the intestines may be a symptom of various abdominal lesions, especially in their later stages, and may depend on a paralysed condition of the intestinal walls.

In ordinary flatulent colic the pain is usually not so acute as in the spasmodic form, but the distress is greater; in a severe case the laboured respiration is due to pressure of the distended intestines on the diaphragm. The indications for treatment are: to neutralise and cause expulsion of the gases in the intestines, to prevent their recurrence, to get rid of the ingesta, and to restore nerve tone to the intestinal walls. For this purpose we administer the oil of turpentine, given in a dose of from 2 to 4 ounces, according to the severity of the case and the size of the patient, combined with a similar amount of aromatic spirit of ammonia, and well shaken up with $1\frac{1}{2}$ pints of raw linseed-oil. Opium in any form should not be administered, but if the pain be severe 1 ounce of chloral hydrate may be given.

In cases presenting alarming respiratory and cardiac distress, the operation of puncturing the intestine by means of a special trocar and cannula should be resorted to without delay. The right flank is usually selected for the operation, and the point of entrance is usually taken as equidistant from the anterior angle of the ilium, the last rib and the transverse processes of the lumbar vertebræ. If the distension be most marked on the left side, this region should be selected for the operation.

The procedure is a simple one and perfectly safe provided aseptic precautions are observed. Neglect of such may lead to the formation of an abscess at the site of puncture, between the muscle and peritoneum, which will require surgical

treatment ; but the occurrence does not add to the reputation of the practitioner.

In cases that tend to recur, we advise the administration of an antiseptic agent, such as 1 to 2 drachms of carbolic acid in a pint of water ; some authorities advise the injection of a similar solution directly into the intestine by means of a special trocar and cannula. It is of importance to obtain a free action of the bowels, and for this purpose another dose of raw linseed-oil may be given if the first dose has not acted. Enemata of warm water and walking exercise assist the expulsion of the gases.

Terebene is also a useful agent in flatulent colic, and may be given instead of the oil of turpentine and in similar doses.

In this affection it is of importance to prevent the animal from lying down and rolling, as such movements would tend to produce rupture of the intestine.

The after-treatment in cases of flatulent colic consists in attention to the diet, and insuring a healthy condition of the intestines by administering moderate doses of Epsom salt in the food or water daily. Agents such as nux vomica and gentian are also indicated, in order to restore the intestines to a normal condition.

The Treatment of Colic due to Impaction of the Colon, also known as Subacute Obstruction of the Double Colon, or Obstructive Colic.

This is one of the commonest forms of what are generally termed prolonged colic cases. The cause of this condition is the presence of bulky indigestible material in the double colon.

The leading symptoms are as follows: The presence of continuous dull abdominal pain, obstinate constipation, depending on arrest of the peristaltic movements of the intestine and impaction with ingesta ; in severe cases paralysis of the intestinal walls is present. If unrelieved, death occurs, either from exhaustion or in some cases from general toxæmia, probably depending on absorption of toxic material resulting from retained intestinal contents.

The diagnosis of this condition is of the greatest importance with reference to its successful treatment. By a careful observation of the symptoms presented, the history of the case, the degree of constitutional disturbance present, and evidence obtained from a general examination of the patient, we are often enabled to distinguish this affection from the more serious and fatal condition of enteritis, or of intestinal obstruction depending on volvulus, etc. To assert that a correct diagnosis is *always* possible would simply lead the student astray, as even the most experienced practitioners may arrive at incorrect opinions in such cases.

Space will not permit of a complete consideration of the symptoms that will enable us to differentiate subacute intestinal obstruction from the more fatal forms.

Briefly speaking, the pain is not so acute as in enteritis. No doubt in these cases at times the pain may vary in character from dull to acute, but it usually returns to the former type.

The pulse in subacute intestinal obstruction may become so altered in character at times as to cause anxiety to the practitioner, but it has not that rapidly running-down character that is met with in enteritis, etc. The temperature is seldom raised to any extent, and the visible mucous membranes are not so intensely injected as in enteritis.

There is also an absence of the well-known haggard expression of countenance and cold sweats so characteristic of serious and fatal abdominal affections.

An examination *per rectum* will show that the portions of intestine within reach are distended with ingesta, while the rectum itself is dilated. The patient at times shows a tendency to force the hind-quarters against the sides of his stall.

Of course, if the case has been treated with full doses of opiates, there will be present in addition the well-known symptoms of excitement induced by these agents.

In former times it was customary to treat this affection by the administration of sedatives, in order to give relief to the pain. The pain was regarded as the important symptom,

while the *cause* of the pain was overlooked—*i.e.*, the presence of irritating ingesta in the intestine.

The effect of opium or its preparations is to interfere with normal peristalsis, and thus induce paralysis of the intestines, a condition which it should be our aim to overcome.

Some practitioners advocate full doses of raw linseed-oil with the sedatives, but we are aware how uncertain this agent is in its purgative action, in some cases causing only extreme nausea, while in others superpurgation ensues after large doses, with laminitis as a sequel; hence we cannot regard it as either safe or effectual in large amounts. A dose of aloes is recommended by other practitioners, but this also has its drawbacks. Either it fails to exert its purgative effect, or it may produce superpurgation, laminitis, or enteritis. Experience has taught us that the use of aloes in the cases we are discussing, although at times successful, is attended by far too much risk and uncertainty to be recommended.

We have adopted on many occasions the stimulant treatment as advised by Mr. H. Caulton Reeks, F.R.C.V.S., in his work 'The Common Colics of the Horse,' and have found it rational in theory and successful in practice. He advises the administration of full doses of nux vomica and carbonate of ammonia, in order to restore nerve power to the walls of the paralysed intestine and to act as a general stimulant to the nervous system.

For a full-sized horse 2 ounces of carbonate of ammonia with 1 ounce of powdered nux vomica are made into four balls, and administered at once. These are followed by a draught composed of 2 ounces of oil of turpentine and 2 ounces of aromatic spirits of ammonia in a pint of raw linseed-oil.

The carbonate of ammonia is repeated at intervals of three hours in 1 or 2 ounce doses until relief is obtained. Should the case appear to be protracted, 1 grain of eserine sulphate is to be administered hypodermically, provided the pulse is strong and not too frequent. If the bowels do not respond

after a reasonable time, this drug may be repeated in a dose of 2 grains.

No sedatives of any kind are given.

Provided our diagnosis is correct, the above treatment gives excellent results. As already mentioned, errors cannot be avoided in dealing with abdominal affections, and when evidences of enteritis or some fatal lesion appear, we have then to adopt the only treatment that is in our power—*i.e.*, the administration of full doses of sedatives.

The important point is not to arrive too hastily at conclusions, and to avoid if possible the error of prescribing sedatives in cases where they are contra-indicated.

In subacute intestinal obstruction the careful administration of enemata by means of the long gum-elastic rectum-tube should never be neglected. Whether cold or warm water should be employed is a matter of choice; the important point is to get the fluid as far as possible into the colon, and to irrigate the bowel.

In some obstinate cases the injection of 2 ounces of pure glycerin has given good results, while in others a pound of this agent has no effect. We have also administered raw linseed-oil by enemata, but found that it was seldom retained long enough to produce any beneficial results.

In order to carry out irrigation of the colon, a considerable degree of tact and patience is required. The tube, well anointed with lard, is to be passed very slowly, and the water pumped in gently at the same time; the gradual distension of the bowel with water enables the tube to find its way. By careful manipulation the tube can be usually inserted to its full length—*viz.*, 6 feet (see p. 86).

In cases of impaction of the single colon the diligent administration of enemata by means of the long rectum-tube is specially indicated.

If after the administration of enemata and eserine the contents of the bowel fail to be evacuated, laparotomy may be attempted, the details of which operation will be found in works on veterinary surgery. To advise and undertake such an operation would require grave consideration on the part

of the practitioner; but if all other means have failed, he is justified in operating, although there may be very remote chances of a successful issue. Up to the present no successful cases are on record.

Cases of intestinal obstruction depending on causes other than those we have mentioned are difficult in their diagnosis and usually fatal in their results. Intestinal concretions, except when their presence can be detected by manual exploration *per rectum*, do not present diagnostic symptoms.

If the presence of an intestinal concretion can be detected, and if enemata and manual dexterity fail to remove it, recourse should be had to laparotomy. Needless to say, in such instances where diagnosis is possible the concretion is situated in the single colon, a portion of the intestines that affords better facilities for successful surgical interference than any other. Probably in the future some successful method of operating will be devised.

If we are satisfied that some serious abdominal lesion is present, such as volvulus, no treatment can be of avail. In our present state of knowledge of affections of this nature, all that can be done is to administer sedatives in full doses, and the drug which we have found best for this purpose is the extract of Indian hemp, given in doses of from $\frac{1}{2}$ to 1 ounce, and repeated until it produces a state of semi-narcosis.

Care should be exercised, however, in arriving at a diagnosis as to whether the case is a hopeless one, and whether the administration of sedatives is the only treatment that can be adopted.

The stimulant treatment of obstructive colic is not always carried out with facility. In the first place, if we do not give some relief to the pain which is present in such cases, the owners are not satisfied, and there are occasions on which the pain becomes acute.

In such we see no objection to give a dose of chloral hydrate, which at any rate will give temporary relief, and need not be repeated unless absolutely necessary. We have not observed that the judicious employment of this agent

interferes to any extent with the peristaltic action of the intestines. In fact, in some instances we have found that it exerts a laxative effect.

At the same time, it is only when the pain becomes very acute that an anodyne is necessary, and we find that once the bowels commence to act the pain disappears.

The next drawback to the adoption of this form of treatment is the difficulty experienced in getting attendants to administer medicines in the form of bolus, especially in a country practice.

It is difficult to administer the requisite amount of ammonia in any other form. As this may have to be given every three hours until relief is obtained, it is quite clear that the practitioner cannot always spare time to administer the medicines as required, and must depend on an attendant to do so.

We have endeavoured to modify the treatment by giving smaller doses of the ammonium carbonate in the form of drench, and combining them with treacle, so as to prevent irritating effects on the mouth and pharynx. While not so effectual as the full doses in the form of bolus, it often proves satisfactory.

FORMULÆ.

Drench for Simple Spasmodic Colic.

R	Ol. menthæ pip.	...	...	5i.
	Spts. ammon. aromat.	...	...	3ii.
	Ol. lini	...	...	O.i.

F. m. Sig.: Give at once.

Anodyne Drench, when Pain is Severe, and the Above fails to give Relief.

R	Chloral hyd.	...	...	5i.
	Mucilaginis <i>vel</i> Theriacæ	...	...	3iv.
	Aquæ	...	...	O.i.

F. m. Sig.: Give at once.

Drench for Flatulent Colic.

R	Ol. terebinth. ...	...	...	℥ii.
	Spts. ammonii aromat.	...	...	℥ii.
	Ac. carbolicæ ...	..	...	℥i.
	Ol. lini ..	...	...	O.i.ss.

F. m. Sig.: Give at once.

Or:

R	Cyllin ...	...	...	℥ii.
	Terebeni ...	...	...	℥ii.
	Ol. lini ...	...	...	O.i.ss.

F. m.

Stimulant and Nerve Tonic Balls for the Treatment of Subacute Obstruction of the Double Colon.

R	Ammonii carb.	...	...	℥ii.
	Pulv. nucis vom.	...	...	℥i.
	Saponis mollis	...	...	q.s.

M. Div. in bol. iv. Sig.: The four balls to be given at once.

N.B.—In cases of young animals and in those of small size the dose of nux vomica should be reduced to $\frac{1}{2}$ ounce.

The above to be followed up with:

R	Ol. terebinth. ...	...	...	℥ii.
	Spts. ammonii aromat.	..	...	℥ii.
	Ol. lini ...	...	...	O.i.

F. m.

Until relief is obtained give the following:

R	Ammonii carb.	...	...	℥i.
	Pulv. zingib. ...	...	...	℥ii.
	Saponis mollis	...	...	q.s.

F. bol. i. Sig.: Repeat every three hours until relief from pain is obtained.

If the case tends to become protracted and the pulse is strong and not too frequent, administer hypodermically 1 grain of eserine sulphate. On next visit, if no action of the bowels, administer 2 grains of eserine sulphate hypodermically.

CHAPTER VII

THE TREATMENT OF DISEASES AND DISORDERS OF THE INTESTINES IN THE HORSE (*continued*).

The Treatment of Enteritis in the Horse.

ACUTE inflammation of the intestines may be regarded as one of the most fatal affections in the horse. Post-mortem experience of this disease enables us to state that of all abdominal lesions it is the most common. A similar experience justifies us in believing that few, if any, cases of acute enteritis recover, and we arrive at this conclusion from a study of the extensive and severe lesions met with at autopsies of this disease.

It is quite true that cases occasionally recover whose clinical histories would lead us to a diagnosis of enteritis; but bearing in mind the difficulty that surrounds the diagnosis of abdominal affections, we are forced to the conclusion that in cases terminating favourably a different and a milder form of the disease must have been present.

Enteritis may commence with symptoms resembling those of ordinary colic, or marked constitutional disturbance may be present from the outset.

In the early stages the pulse is hard and quick, but it soon tends to become weak and thready. The respirations are accelerated; the temperature rises; the visible mucous membranes are deeply injected; the extremities become cold; the pain is continuous and of an agonising character; the animal constantly lies down and rises, turns his head towards his flanks and groans.

Other features in the clinical picture are a tense, hard condition of the abdominal muscles (in some cases there may be retraction of these muscles and a tucked-up appearance, without any tympanites), and a haggard expression of countenance. Towards the termination of the case tympanites usually appears, the pulse becomes imperceptible, cold sweats bedew the body, an apparent freedom from pain occurs, and the animal dies from exhaustion.

We are unable from an observation of the symptoms to decide whether the small or the large intestines are involved. In very acute cases, which only last a short time, we often find the small intestines affected, the mucous membrane thickened, of a dark red colour, and effusion of blood into the intestinal canal. In less acute cases, lasting a longer time, the large intestines may be involved, the contents blood-stained and very fœtid, and the intestinal walls gangrenous in patches. Such cases may live for two or even three days, while under the influence of anodynes, and then die from pulmonary gangrene and general septicæmia, an abominable odour from the breath being a marked symptom.

The autopsy reveals the lesions of enteritis in the large intestine, and the presence of septic pneumonia or pulmonary gangrene. Very little is known with reference to the causes of enteritis. Some authorities believe that unrelieved cases of obstructive colic may terminate in enteritis; this is, however, doubtful.

The disease may occur as a complication of purpura hæmorrhagica, and of epizootic cellulitis or pink-eye. Verminous aneurism of the mesenteric artery may also produce it. Horses fed on ground maize, when unaccustomed to this form of food, may be attacked with enteritis, the autopsy revealing the presence of the hard particles of this substance in the intestines, these probably acting as irritants to the mucous membrane.

In the treatment of enteritis, the indications are to relieve pain and to render the intestinal canal as quiescent as possible by checking the peristaltic action. Except in the case of irritant poisons, in which purging may occur in the earlier

stages of enteritis, intestinal paralysis is usually present, so that the second indication is not always of importance.

The time-honoured agent for the relief of pain in enteritis is opium or morphine. Ordinary medicinal doses have no anodyne effect in this condition, while if larger doses be given, exciting effects are produced (see p. 248).

To combat these a combination of chloral hydrate with the opiate is often employed, and sometimes succeeds; but the agent which produces the most marked anodyne effects in enteritis is *cannabis indica*. This is best administered in the form of drench, and reliable fluid preparations of the drug can now be obtained. Many preparations of it are worthless, and this will account for the unfavourable reports we occasionally hear with reference to its value as an anodyne.

A fluid extract, standardised physiologically, is prepared by Messrs. Parke, Davis and Co. Of this, $\frac{1}{2}$ ounce mixed in glycerin, mucilage, and water will be found an efficient dose. This can be repeated as required.

Beyond keeping the animal as free from pain as possible by administering this agent, little further can be done. Enemata of warm water are advised, also the application of cloths wrung out of hot water to the abdominal walls; but it is doubtful whether such treatment is of any real value.

Cases of recovery from acute enteritis are recorded, but we are doubtful with reference to the correctness of the diagnosis. It is quite possible for cases of a less severe type of the disease to recover, but we are unaware of the actual lesions that were present in the intestines in such instances. The affection is diagnosed as enteritis from an observation of the symptoms present, but we know too well how deceptive symptoms frequently prove to be.

If a case which has presented symptoms suggestive of enteritis begins to show signs of improvement, great care is necessary in its treatment. Enemata should be administered with the long rectum-tube, in order to obtain an action of the bowels, and sulphate of magnesia in 2-ounce doses may be given in the drinking-water for a similar object.

The diet should be restricted to well-boiled oatmeal-gruel, linseed-tea, milk, etc. In order to prevent any danger of septic infection from the intestinal canal, small doses of carbolic acid and hyposulphite of soda should be administered. On no account are active cathartics of any kind to be given.

If the bowels do not act, a moderate dose of raw linseed-oil may be given, and enemata of the same agent should be administered at intervals with the long rectum-tube.

Here a word of warning is necessary with reference to the diagnosis of enteritis. If a hasty opinion be arrived at that a case is one of enteritis, the usual course is to commence the administration of sedatives forthwith. Should the case prove to be one of subacute intestinal obstruction, and if opiates of any kind are given, such treatment is calculated to increase the serious condition that is present. We are well aware that in some of these cases of obstructive colic the pain may be very severe and continuous, and may lead one to a diagnosis of enteritis.

We see no objection in a doubtful case to administer chloral hydrate when the severity of the pain would seem to indicate an anodyne. As previously mentioned, this drug does not tend to produce a paralysed condition of the intestine.

FORMULÆ.

Anodyne Drench in Enteritis.

R	Ext. cannabis indicæ liq.	...	...	...	℥ss.
	Glycerini	...	...	...	℥ii.
	Mucilaginis	...	...	...	q.s.
	Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give at once. Repeat in an hour if no effect, and also when necessary. In severe cases double the above dose may be given.

Opiate Drench in Enteritis.

R	Liq. opii concent.	...	...	...	℥ss.
	Chloral hyd.	...	...	...	℥i.
	Mucilaginis	...	...	...	℥ii.
	Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give at once. Repeat as required.

Or:

R	Morphinæ hydrochlor.	...	grs. iv. to grs. vi.
	Chloral hyd.	...	ʒi.
	Mucilaginis ...	...	ʒii.
	Aquæ...	...	ad O.i.
F. m.	Sig.: Repeat as required.		

The Treatment of Constipation.

Constipation is to be regarded as a symptom rather than a distinct affection. In some horses the excreta are constantly in a harder condition than natural, just as in others the opposite condition is met with. It may depend on a want of tone of the intestinal walls, or on a deficiency of the intestinal secretion, or on interference with the functions of the liver as the result of hepatic disorder. It is present in all febrile affections, in various diseases, and also occurs as a sequel to colic when opiates have been administered.

In the treatment of this condition it is important to ascertain the cause, and to prescribe measures accordingly. Food of a laxative nature will be indicated, and the administration of salines, such as the sulphate of magnesia or sulphate of soda, in 1 or 2 ounce doses, twice daily, in the food or drinking-water, will prove beneficial. When this condition is habitual it is useless prescribing purgatives constantly. Nervine tonics, such as *nux vomica*, are indicated to restore muscular tone to the intestinal walls.

When constipation is present during the course of febrile affections, such as influenza, active cathartics should not be employed; but the sulphate of magnesia in 1 or 2 ounce doses should be given twice daily in either the food or the drinking-water. The judicious employment of enemata also proves useful in such cases.

As a sequel to colic, constipation is frequently met with, and may prove very obstinate. Although we cannot regard saline cathartics, such as the sulphate of magnesia or sulphate of soda, as always reliable in the horse, we find that in small repeated doses they produce the desired effect. In addition to the administration of the above, enemata given with the long rectum-tube are indicated, and in obstinate

cases the addition of glycerin has proved efficacious at times.

The Treatment of Constipation and Obstructive Colic in Foals.

We meet with a form of constipation in foals shortly after birth, due to retention of the meconium. Unless relief be promptly given serious results will ensue, such as obstruction of the colon, or enteritis from irritation of the mucous membrane.

The animal is found in pain, constantly straining and forcing the hind-quarters against solid objects. On rectal examination, we find the passage blocked by a firm rounded pellet of fæcal matter, and there are usually a number of these in the rectum and floating colon. The treatment consists in adopting gentle measures to remove the hardened pellets. Those close to the anus may be removed with the finger; enemata are then carefully given with a special gum-elastic enema-tube. Great patience is required in this process, and on no account must the tube be forced when it meets with an obstruction in the passage. We have found the injection of warm olive-oil very useful for facilitating the removal of these obstructions. From 1 to 2 ounces of castor-oil, with an equal amount of olive-oil, should be given by the mouth, and repeated if necessary.

In more serious cases there is obstruction from these masses in the colon. Severe pain and abdominal distension are present, the animal alternately lying down, rising, and rolling on his back. In such instances it is necessary to relieve the pain, otherwise exhaustion will soon occur. From $\frac{1}{2}$ to 1 drachm of chlorodyne, according to the size of the foal, may be given combined with the castor-oil. The enemata must be continued at intervals. Frequently it will be found that a hard fæcal pellet is lodged far back in the rectum and obstructs the passage of the enema; in order to remove this, the smooth handle of a spoon must be very carefully inserted and the hard mass gently dislodged, care being taken not to injure the intestine. Rugs,

thoroughly wrung out of hot water, should be applied to the abdominal region. The chlorodyne should not be repeated unless absolutely necessary to relieve acute pain. We find that in foals this agent is preferable to chloral hydrate, and by combining it with castor-oil, its constipating effects are overcome. When the pain is less severe, spirit of chloroform in doses of $\frac{1}{2}$ to 1 drachm often affords relief.

If enteritis supervenes, the case is always fatal in our experience; all that can be done is to administer anodynes, and repeat them when necessary. Early treatment in every instance of constipation in foals is of the greatest importance, as these animals, being of a delicate nature, soon become exhausted unless relief is obtained.

In foals that show a tendency to constipation, it is found that by administering small doses of magnesium sulphate to the dam, the milk is rendered slightly laxative.

The Treatment of Diarrhœa and Superpurgation.

Diarrhœa may be a simple temporary affection, due to the presence of some irritating or indigestible material in the alimentary canal, and in such an instance it may be regarded as an effort of Nature to bring about a normal condition. On the other hand, diarrhœa may depend on gastric and intestinal disorders, wasting diseases, irrational methods of feeding, the action of irritants, or the presence of intestinal parasites. This condition varies from a fluid state of the fæces, with frequent defæcation, and an absence of constitutional disturbance, to one of a more serious state of affairs, characterised by irritation of the intestines, depression, loss of appetite, and gradual weakness of the system. To the latter condition the term 'superpurgation' is applied. It may result from the action of an ordinary dose of aloes in a horse possessing a special idiosyncrasy to the action of this drug. Neglect of the usual precautions after the administration of aloes (see p. 339), or too large a dose of the drug, may also produce it.

If raw linseed-oil be given in large and repeated doses superpurgation may ensue. Our experience of this agent is

that its action in large amounts is very uncertain, and often dangerous.

Some horses, especially those of a nervous, excitable temperament, have a tendency to diarrhœa without any apparent cause. They purge either a short time after feeding or when on a journey. New oats and new hay frequently cause diarrhœa, also roots, more especially raw potatoes; the latter may produce serious symptoms. The period of teething also has a tendency to cause looseness of the bowels, and we often find four-year-old horses subject to this condition when first put to work.

In foals a very obstinate and sometimes serious form of diarrhœa is met with, often depending on irrational treatment of the dam while nursing the young animal (see p. 424).

The rational treatment of diarrhœa is to ascertain, if possible, the cause of the affection. If depending on unsuitable food, the diet must receive attention. A moderate dose of raw linseed-oil will be indicated in order to assist Nature in getting rid of the offending ingesta. If the purging continues it must not be checked too rapidly. Antacids such as prepared chalk or bicarbonate of soda should be given in flour-gruel, along with a simple bitter, such as compound tincture of gentian. If the condition becomes severe, a dose of tincture of opium or chlorodyne, with sweet spirit of nitre, will be indicated. If superpurgation occur, evidenced by continuous purging of fœtid material, constitutional disturbance, coldness of the extremities, uneasiness, alteration in the character of the pulse, etc., chlorodyne, with sweet spirit of nitre, and a carminative, such as oil of peppermint, should be administered in flour or starch gruel, and repeated if necessary.

The general comfort of the animal should receive attention, such as warm clothing to the body and bandages to the legs. In this condition it is by no means unusual for acute laminitis to supervene, and this will require appropriate treatment.

In some cases of superpurgation, prostration of strength is a leading symptom, and stimulants such as brandy are indicated, and should be repeated at intervals. Care must be

taken in these cases not to administer opiates in too large doses, otherwise serious symptoms may supervene, such as obstinate constipation and the occurrence of tympanites.

In other forms of diarrhœa the administration of intestinal antiseptics, such as carbolic acid or cyllin, frequently gives good results. Chronic indigestion is often a cause of diarrhœa, the ingesta entering the intestine before gastric digestion is completed; this condition will require appropriate treatment (see p. 425).

If the animal has a tendency to purge soon after feeding, this probably depends on the nervo-muscular structures of the stomach being deranged. In such cases small doses of arsenic sometimes prove useful. If mastication of the food is not properly carried out, the teeth should receive attention.

In the simple diarrhœa of foals a dose of castor-oil should first be administered; attention is then to be directed to the proper management of the dam. Antacids such as the bicarbonate of soda may be given to the latter, and she should not be worked.

If the condition be more severe, it will be necessary to administer chlorodyne in doses varying from $\frac{1}{2}$ drachm to 1 drachm, according to the age and size of the patient. With this we combine 1 or 2 drachms of prepared chalk and $\frac{1}{2}$ ounce of peppermint-water, and administer it in starch or flour gruel (see formulæ, p. 474). If exhaustion be present, we may add two glasses of port wine and 1 ounce of brandy. These may be repeated in three or four hours if necessary.

The diet in cases of severe diarrhœa and superpurgation in the horse should be restricted to boiled flour-gruel, starch-gruel, and milk. Lime-water may be added to the latter with advantage.

The Treatment of Dysentery.

Dysentery is not a common affection in the horse. Its causes are obscure, and it is evidenced by frequent purging, the excreta being mixed with blood and flakes of lymph, and possessing an abominable odour.

A certain amount of uneasiness is present, sometimes amounting to actual pain, while constitutional disturbance, with exhaustion, supervenes in severe cases. The severity of the symptoms will depend on the extent of the lesions in the intestinal mucous membrane.

The indications for treatment are—to allay irritability of the alimentary canal, and to prevent absorption of septic materials from the intestines by administering internal antiseptics.

We have found it of advantage to commence treatment with the administration of a dose of chlorodyne, varying in amount according to the degree of pain present. We follow this up with small doses of oil of turpentine, with ipecacuanha and carbolic acid, given in starch or flour gruel (see formula, p. 475).

We allow linseed-tea *ad lib.* for the patient to drink, also oatmeal-gruel and milk, but no solid food. If there be exhaustion present, we order port wine and eggs beaten together; and if the hæmorrhage continues, the medicinal agents may be repeated.

Dysentery is met with in young foals, and often proves very fatal. The treatment is to be carried out on similar lines to the above.

FORMULÆ.

Laxative Powders for Habitual Constipation in the Horse.

R Sodii sulphat.	...	...	...	℥iv. ss.
Potassii sulphat.	...	...	...	℥ii.
Sodii chlor.	...	...	...	℥ii. ss.
Sodii bicarb.	...	...	...	℥iv. ss.

M. Div. in pulv. vi. Sig.: Give one twice a day in the food or in the drinking-water.

For Cases depending on Want of Muscular Tone in the Intestinal Walls.

R Aloes Barb.	...	...	...	℥i.
Pulv. nucis vom.	...	...	...	℥ss.
Ext. belladonnæ virid.	...	...	...	gr. xx.
Excipient.	...	...	...	q.s.
F. bol. i. Mit. vi.	Sig.: Give one every day.			

Astringent Mixture for Severe Diarrhœa in the Horse.

R Chlorodynī	...	...	...	℥x.
Cretæ præp.	...	...	...	℥ii.ss.
Tinct. camph. co.	...	...	...	℥v.
Aquæ	...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every three or four hours in a pint of boiled flour-gruel, until relief is obtained.

For Cases in which the Excreta are very Fœtid.

R Cyllin	...	...	...	℥x.
Cretæ præp.	...	...	...	℥ii.ss.
Tinct. camph. co.	...	...	...	℥v.
Tinct. gentianæ co.	...	...	...	℥v.
Aquæ	...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every three or four hours as required, in a pint of boiled flour-gruel.

For Simple Diarrhœa in Foals up to a Week Old.

R Ol. ricini	...	...	...	℥i.
Liq. potassæ	...	...	...	℥.xxx.
Mucilaginis	...	...	...	q.s.
Ol. menth. pip.	...	...	...	℥v.
Aquæ	...	...	...	ad ℥ii.

F. m. Sig. : Give at once. In older foals give double the quantity of castor-oil.

If stimulants are indicated, add to the above $\frac{1}{2}$ ounce of brandy, or from 1 to 2 drachms of spts. æth. nit., or spts. ammon. aromat.

If the above fails to check the diarrhœa, and if the latter is severe, the following mixture may be given :

R Chlorodynī	...	...	...	℥iii.
Cretæ præp.	...	...	...	℥i.ss.
Tinct. camph. co.	...	...	...	℥i.
Aquæ menth. pip.	...	...	...	ad ℥vi.

F. m. Sig. : Give two tablespoonfuls every three or four hours in starch-gruel.

Or :

R Catechu pulv.	...	...	...	℥iii.
Cretæ præp.	...	...	...	℥iii.
Spts. ammon. aromat.	...	...	...	℥ii.
Tinct. opii	...	...	...	℥i.
Aquæ menth. pip.	...	...	...	ad ℥xii.

F. m. Sig. : Give from 1 to 2 ounces, repeated as required, in a little of the mare's milk.

(H. CAULTON REEKS.)

If constipation should occur as a sequel, give :

R	Ol. ricini	...	...	...	̄i.
	Glycerini	...	...	...	̄ss.
	Ol. menth. pip.	...	...	...	℥ x.
	Aquæ	...	...	...	ad ̄ii.
F. m. Sig.: Give in one dose.					

Mixture for Dysentery in the Horse.

R	Ol. terebinth.	...	...	...	̄x.
	Ac. carbolicæ	...	...	...	̄ii.ss.
	Tinct. camph. co.	...	...	...	̄v.
	Vini ipecac.	...	...	...	̄v.
	Ol. olivæ	..	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours
in a pint of flour-gruel.

Or :

R	Bismuthi carb.	...	...	...	̄ii.ss.
	Pulv. ipecac. co.	...	...	...	̄i.
	Tinct. catechu.	...	...	...	̄v.
	Cyllin	...	..	...	̄x.
	Mucilaginis	...	...	...	̄iv.
	Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours
in a pint of flour-gruel.

If weakness is present, stimulants such as brandy may be added to the above.

For cases attended with pain :

R	Chlorodyni	...	...	...	̄x.
	Ext. hæmatoxyli liq.	...	...	...	̄ii.ss.
	Vini ipecac.	...	...	...	̄v.
	Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours
until relief is obtained.

The Treatment of Peritonitis.

Acute inflammation of the peritoneum in the horse is usually of a septic character, resulting from wounds of the abdominal cavity, or as a sequel to operations such as castration. Peritonitis is also met with in cases of rupture of the stomach or intestine. We rarely encounter the affection in the absence of these causes. Septic peritonitis also occurs in cases of septic metritis.

Peritonitis is often ushered in with rigors, succeeded by pain of a dull, persistent character, a drawn-up appearance of the abdomen, thoracic breathing, a wiry pulse, gradually becoming weaker, paralysis of the intestines, evidenced by obstinate constipation, and a rise in temperature.

In the later stages the pulse becomes imperceptible, and a tympanitic condition of the abdomen is present, with coldness of the surface and extremities, a haggard expression of countenance, and symptoms of collapse.

We meet with cases occurring after the operation of castration in which dulness, persistent loss of appetite, obstinate constipation, and a disinclination to move in the stall are prominent symptoms. There is usually no swelling at the site of operation, and in some instances no evidences are present of the operation wounds being in a septic condition.

The treatment of cases of peritonitis is anything but satisfactory. Judging by the post-mortem appearances of this affection, we fail to see how any treatment could be of benefit. The large amount of septic material found in the peritoneal cavity in such cases must of necessity prove fatal, and this is our experience of the affection. No doubt the administration of anodynes gives temporary relief from pain, and masks the symptoms of the disease.

In our present state of knowledge, all that we can do is to administer agents for the relief of pain, and to apply rugs wrung out of hot water to the abdomen, with a similar object in view.

It has been suggested that in cases of general septic peritonitis a purgative should be administered. We fail to see how such treatment could possibly be of service, as the constipation which is present is the result of the disease; and, even if purgation were induced, it could exert no effect on the septic inflammation of the peritoneum, but would increase the animal's sufferings and hasten the fatal termination. Peritonitis may also occur by extension of disease from the abdominal organs.

A form of peritonitis is sometimes met with in young horses which is generally of a subacute or chronic character,

and depends on obscure causes, such as neglect and exposure. The diagnosis of this condition is by no means easy, and the treatment seldom satisfactory. The pain is to be relieved by opiates, and the strength to be maintained by the judicious employment of stimulants and tonics.

The Treatment of Ascites.

Ascites or dropsy of the peritoneum may occur as the result of an attack of subacute or chronic peritonitis, and as such we meet with it occasionally in young horses that are neglected as regards feeding and housing. Attention to food and to surroundings, with the administration of suitable tonics and the iodide of potassium, will constitute the treatment. Ascites may be a symptom of disease affecting other organs, such as certain forms of cardiac, hepatic, and renal diseases. It is sometimes met with in aged brood-mares that have borne many foals.

In the treatment of ascites it is necessary to ascertain the nature of the disease of which it is a symptom. As the cause is generally an organic affection of some important internal organ, treatment is seldom satisfactory. Tapping the abdominal cavity has been resorted to, but with only temporary benefit. The judicious administration of saline purgatives, diuretics, and the iodide of potassium proves useful in reducing the amount of fluid in the peritoneal cavity, while the other details of treatment will depend on the organ which is affected.

CHAPTER VIII

THE TREATMENT OF DISEASES AND DISORDERS OF THE INTESTINES (*continued*)

The Treatment of Intestinal Diseases in the Ox.

INTESTINAL diseases are not so frequently met with in the ox as in the horse, the intestines in the former being of lesser importance than the stomach.

Spasmodic colic occasionally occurs, and is evidenced by restlessness, stamping of the feet, striking the abdominal region with the hind-feet, whisking of the tail, constant change of position, etc.

An anodyne drench containing chloral hydrate, followed by a purgative, such as the sulphate of magnesia, is generally all that is required in the way of treatment. In many cases a diffusible stimulant will give relief.

Flatulent colic may occur, but its diagnosis is difficult, as tympanites of the rumen causes similar symptoms. The treatment of both affections is carried out on the same lines.

Enteritis in varying degrees of severity is met with, and is very often accompanied by gastritis. Irritant poisons, or the effects of coarse, indigestible fodder, may produce this condition. Although in text-books gastro-enteritis and enteritis are described in their different forms, we find in practice that it is not possible to differentiate one affection from the other.

The presence of continuous pain, constitutional disturbance, constipation, or a small amount of hardened fæces

passed with mucus or blood, grinding of the teeth, a moan or grunt, etc., will lead us to the conclusion that inflammation of some portion of the alimentary canal is present, but we cannot be more definite.

Treatment is to be carried out on similar lines to those already described for the horse. A full dose of raw linseed-oil may be given at the commencement. If the pain be severe, chlorodyne will be indicated. Belladonna in full doses, with bicarbonate of soda, should be administered in treacle every three or four hours, and mucilaginous drinks allowed.

Frequently treatment is not satisfactory, but there is more chance of success in the treatment of enteritis in the ox than in the horse.

Dysentery in the ox is of frequent occurrence, and may be acute or chronic. When depending on the presence of intestinal tuberculosis it is usually chronic, and, of course, no treatment can be of any avail. The acute form of dysentery is believed to depend on contaminated water and irritant pasture grasses.

The treatment is on similar lines to those suggested for this affection in the horse. Unfortunately the disease is often fatal, in spite of every form of treatment. Small doses of turpentine, with belladonna and antacids, have proved useful; but when the disease assumes a chronic form, the case seldom repays the cost of treatment.

White Scour is a familiar disease in calves. The results of recent researches suggest that the affection depends on the entrance into the system of a special micro-organism through the umbilicus. Up to the present time no line of treatment has been found successful, but preventive measures have produced good results in some instances. These consist of cleanliness of the surroundings before the cow calves, and the application of an aseptic ligature and antiseptic dressings to the umbilical cord of the calf.

Recently Professor Jensen, of Copenhagen, has introduced a serum for the prevention of this disease, which appears likely to prove of value.

The Treatment of Intestinal Affections in the Dog.

The intestines of the dog have a very important part to play in the process of digestion ; hence we find this portion of the alimentary canal subject to various important diseases and disorders.

Errors in feeding and want of exercise are prominent factors in the causation of intestinal affections, while gastric disorders have an influence in the same direction.

Generally speaking, the most common affections of the intestines we meet with in canine practice are constipation, intestinal obstruction, and a form of dysentery which occurs in the gastro-intestinal form of distemper, and also as the result of ptomaine-poisoning.

Spasmodic colic, as a disease *per se*, is not frequently met with, but colicky pains may be present as symptoms of various intestinal affections.

In many instances it is difficult to ascertain the cause of abdominal pain, and rules laid down for the diagnosis of intestinal affections based on the character of the pain cannot be relied on.

Chronic pachymeningitis has often been mistaken for an intestinal affection, as constipation, abdominal distension, and shrieks of pain when the animal is handled are some of the symptoms of this affection (see p. 563). This has also been described as rheumatism affecting the abdominal muscles. In the primary attacks of the former affection an active cathartic often causes a disappearance of the symptoms ; hence it is concluded that it is of intestinal origin, but in reality the disease is a nervous one.

In the treatment of simple colic the first step is to administer a dose of castor-oil, and with this may be combined from 5 to 20 minims of spirit of chloroform, according to the size of the dog. Enemata of warm water should also be given.

Opiates should be avoided if possible, but if the pain be severe a hypodermic injection of morphine may be given—from $\frac{1}{6}$ to $\frac{1}{4}$ grain, according to the size of the animal ; or the compound tincture of camphor may be combined with

the castor-oil in doses of from 20 to 60 minims. Small doses of belladonna, being less likely to cause constipation than opiates, may be given instead (see formula, p. 488).

In puppies the presence of intestinal parasites (the *Ascaris marginata*) may give rise to severe colicky pains, and even cause intestinal obstruction. Suitable anthelmintics must be administered in such cases (see formula, p. 353).

Colicky pains, accompanied with distension of the intestines, may occur in puppies, and may depend on the intestinal contents becoming acid and irritating from abnormal decomposition of the ingesta. A small dose of castor-oil should be given, and this is to be followed up with an antacid laxative mixture (for formula, see p. 488).

Enteritis, except as the result of irritant poisons, is not of frequent occurrence in the dog. By this we mean enteritis not depending on intussusception, strangulation, or obstruction of the intestine, such as we meet with in equine practice. Constitutional disturbance, constant pain, tenderness and distension of the abdominal region, constipation, sometimes preceded by diarrhœa, injected conjunctivæ, panting, etc., are symptoms which may serve to distinguish this condition from simple colic. The diagnosis of such cases is not by any means easy, as it is often difficult to ascertain the cause of the symptoms presented.

In the treatment of enteritis opiates must be administered to relieve the pain. The liquor opii sedativus should be given, in doses according to the size of the patient and the severity of the symptoms, and repeated as required.

Flannels wrung out of hot water should be applied to the abdominal region. The diet must be restricted to milk.

The Treatment of Intestinal Obstruction in the Dog.

Intestinal obstruction depends on various causes. We may have simple impaction of the colon and rectum, with hardened fæces. The presence of sharp pieces of bone is also a frequent cause of obstruction. In young dogs especially

foreign bodies swallowed in play may become lodged in various parts of the intestine; while conditions such as intussusception, etc., also give rise to symptoms of obstruction.

In simple impaction of the colon the symptoms presented are obstinate constipation, loss of appetite, vomiting, uneasiness, sometimes amounting to actual pain, and frequent attempts at defæcation. On examination, the abdominal region is found in a distended condition.

Impaction of the colon, accompanied by paralysis of the hind-limbs, is a symptom of that spinal affection known as chronic ossifying pachymeningitis. Formerly the intestinal impaction was believed to be the cause of the paralysis. By constant observation of these cases and careful post-mortem examinations, Mr. H. Gray has proved that the impaction of the intestine is the *result*, and not the cause, of the spinal affection.

The presence of hard fæcal masses or portions of bones in the rectum is a common cause of intestinal obstruction in the dog. In many of these cases great pain is manifested when the animal makes attempts to defæcate.

In the treatment of simple impaction of the colon we administer a full dose of castor-oil, and, if this be rejected by the stomach, we prescribe calomel in the form of pills, in doses varying according to the size of the patient.

Enemata of warm water should be administered by means of a gum-elastic rectum-tube. This process requires a degree of skill in manipulation, and should be persevered in, even though the fluid be not retained. In many cases we find that warm olive-oil or glycerin slowly injected gives beneficial results.

A digital examination of the rectum should always be made, as by this means we can discover the presence of hard fæcal masses, sharp pieces of bone, or other foreign bodies, and take steps to remove them. In administering the enemata, great care is necessary in order to avoid injury to the mucous membrane of the intestine.

In intestinal obstruction depending on the presence of a foreign body in some portion of the intestinal tube, more

urgent symptoms are usually present. Pain, which may be continuous or intermittent, abdominal distension, persistent vomiting, obstinate constipation, and gradual weakness, are the usual symptoms observed. In some cases convulsive fits may occur, followed by a comatose condition, while in others paralysis of the hind extremities may be present. Intestinal obstruction may be due to the condition known as intussusception, and the most frequent form of this lesion in the dog is when the cæcum and terminal portion of the ileum become inverted and pass into the colon.

To ascertain the cause of intestinal obstruction is a difficult matter, and no symptom or set of symptoms can be regarded as diagnostic in this direction. If the treatment indicated—viz., full doses of castor-oil and the careful and continued administration of enemata—fails to give relief, laparotomy should be resorted to, the details of which will be found in works on veterinary surgery.*

The administration of opiates in such cases is not only useless, but productive of harm; they mask the symptoms and give a false appearance of improvement, besides causing great depression in their after-effects. Operation should be resorted to early, before the vital powers commence to flag; it gives the only chance of a successful termination, and is far more humane than allowing the animal to die a lingering death. Under aseptic precautions the abdominal cavity of the dog can be explored with comparative safety, and surgical measures adopted according to the conditions present, with a reasonable hope of success, provided the operation is carried out at a sufficiently early stage.*

The Treatment of Constipation in the Dog.

Constipation is a symptom of many affections, and also a condition of common occurrence, especially in house-dogs. Irrational feeding and want of exercise are two important factors in its causation. In some cases atony of the muscular coat of the intestine is present, and in such instances the affection becomes chronic.

* Consult 'Surgical Diseases of the Dog and Cat,' by Prof. Hobday.

In the treatment of constipation repeated doses of purgative medicine are contra-indicated. If possible the cause of the affection should be ascertained, and, after the administration of a purgative, suitable measures should be prescribed. If the affection depends on atony of the muscular coat of the intestine, nerve tonics are indicated, and in all cases food of a laxative nature should be ordered.

A very useful agent in these cases is cascara sagrada, given as the fluid extract or in the form of tablets (see p. 342). This, while acting as a mild aperient, also has a tonic effect on the intestine. Regular feeding and exercise should be insisted on. If the constipation depends on gastric or hepatic affections, therapeutic measures must be adopted accordingly.

The Treatment of Diarrhœa in the Dog.

Diarrhœa may be a simple condition, terminating in spontaneous recovery, or it may assume a more serious character, with exhaustion as a leading feature. To adopt measures for the rational treatment of this disorder, we must endeavour to ascertain its cause.

If depending on the presence of irritating ingesta, the first step will be to administer a moderate dose of castor-oil, in order to assist Nature in the expulsion of the offending materials. The further treatment will depend on the symptoms presented and on the condition of the patient. If the frequency of the motions tends to weaken the patient, a mixture containing the compound tincture of camphor, prepared chalk and peppermint-water will be indicated; but care must be taken not to continue this treatment so as to produce the opposite condition—viz., constipation. No solid food should be allowed, but milk and lime-water, boiled arrowroot, boiled rice, and beef-tea should form the diet.

Diarrhœa may be a symptom of gastric or intestinal disorders, and as such will require suitable treatment. It is also met with in certain forms of canine distemper. In many instances small doses of chlorodyne will be found necessary to check the excessive discharges from the bowel,

and to allay irritation. If exhaustion be present stimulants will be indicated, of which small amounts of port wine will be found the best.

A very troublesome form of diarrhœa is met with in young puppies after weaning. It usually depends on their inability to digest cow's milk, and experience has taught that it is not wise to allow them milk fresh from the cow. Milk should be allowed to stand for a time, and it is advisable to add one-sixth part of lime-water if it shows any tendency to disagree with the animals. If the diarrhœa be excessive, small doses of the compound tincture of camphor should be given.

In obstinate cases of diarrhœa in the dog a combination of dilute sulphuric acid, decoction of logwood, and infusion of cloves is advised by Mr. H. Gray. This mixture we have found to succeed when many others have failed (for formula, (see p. 490).

The Treatment of Dysentery in the Dog.

Dysentery may occur in the dog without any appreciable cause, but in many instances the ingestion of decomposed food will produce it. It is also met with in the intestinal form of distemper.

The symptoms vary in severity according to the lesions in the intestine ; thus in some cases only a slight inflammation of the mucous membrane is present, while in others the greater portion of the large intestine is intensely inflamed, and ulceration may result.

The leading symptoms are diarrhœa, accompanied by the frequent evacuation of small amounts of mucus mixed with blood. This increases as the disease progresses. The animal strains constantly, as if endeavouring to defæcate; the back is arched, and the abdominal muscles are retracted.

Other symptoms are palpitation of the heart, vomiting, excessive thirst, and total loss of appetite. In fatal cases marked exhaustion occurs, accompanied by very fœtid breath, and gradual paralysis of the hind extremities.

In the treatment of dysentery it is advisable to commence

with the administration of a moderate dose of castor-oil. A mixture containing bismuth and liquor opii sedativus should then be given every three or four hours. Small doses of ipecacuanha also prove useful.

Attention to feeding is of the greatest importance. Milk and lime-water and Brand's Essence of Beef should be the diet allowed during the acute stage. If exhaustion be extreme, the judicious administration of stimulants such as port wine is indicated.

Small enemata containing a fluid extract of opium in cold mucilage of starch often prove useful in the treatment of dysentery.

A form of gastro-enteritis, with profuse discharge of dark-coloured blood mixed with mucus, is met with in dogs as the result of feeding on decomposed meat. A marked symptom is a tumultuous action of the heart; great exhaustion is present, also panting, and vomiting of a large quantity of frothy material. The treatment is similar to that mentioned for dysentery. This affection often proves very fatal in spite of every form of treatment.

Many forms of gastro-enteritis are mentioned by authorities, but as a differential diagnosis is difficult, and as the general principles of treatment do not differ from those already laid down, we do not consider that they merit further attention from a therapeutical point of view.

The Treatment of Peritonitis in the Dog.

Peritonitis is not a common affection in the dog. It usually arises from external injuries, wounds of the abdominal cavity, also in the bitch from septic metritis. It also occurs as the result of abdominal operations in which aseptic measures have been neglected.

The symptoms usually observed are continuous pain, a drawn-up condition of the abdominal muscles, marked tenderness on pressure of this region; in the later stages a tympanitic condition appears. Obstinate vomiting, loss of appetite, and constipation depending on intestinal

paralysis are also present. The pulse in the earlier stages is hard and wiry, afterwards becoming weak and gradually imperceptible. Respirations are accelerated and thoracic in character, and the temperature is elevated.

Treatment is seldom satisfactory. Opiates are indicated to relieve the pain, and fomentations should be diligently applied to the abdominal walls. In cases of general septic peritonitis, saline purgatives are recommended by some authorities, but in our experience they do not prove of any value; the majority of such cases prove fatal, no matter what treatment be adopted.

The only chance of success is to perform laparotomy, to remove the morbid material present, and to irrigate the peritoneal cavity with normal saline solution. This operation should be performed sufficiently early before the vital powers commence to flag. Although a fatal termination is to be expected, the operation is worth a trial.

Ascites, or abdominal dropsy, being a symptom of various diseases, such as those of the liver, heart, kidneys, or arising from a diseased condition of the peritoneum itself, must be treated according to the affection which it accompanies.

Paracentesis abdominis — *i.e.*, an operation for withdrawing the fluid by means of a trocar and cannula—gives temporary relief. In the case of favourite dogs, where our instructions are to prolong life, we administer the iodide of potassium and diuretics such as the acetate of potassium, also saline purgatives. This treatment, along with the operation mentioned above, may prove successful for a time; but as the condition depends on an organic affection of some important organ, it recurs in a short time, and the patient ultimately succumbs.

We have met with a few cases in which no actual cause could be assigned for the ascites. After removing the fluid a few times and administering a course of potassium iodide, the patients made a complete recovery. These cases, however, are exceptional.

FORMULÆ.

Carminative Anodyne Mixture for Colic in the Dog.

R	Tinct. belladonnæ	...	...	̄ss.
	Tinct. cardamomi co.	...	...	̄vi.
	Spts. ammon. aromat.	...	...	̄ii.
	Spts. chloroformi	..	...	̄ii.
	Sodii bicarb.	...	...	̄i.
	Aquæ menth. pip.	...	...	ad ̄vi.

F. m. Sig.: From two teaspoonfuls to two tablespoonfuls (according to size of dog) to be given every two hours until pain is relieved.

Aperient Draught for Colic in the Dog.

R	Ol. ricini	...	...	̄ii. to ̄vi.
	Tinct. rhei	...	...	̄ii.
	Tinct. opii	...	...	℥ x. to ℥ xv.
	Aquæ menth. pip.	...	...	ad ̄i. to ̄ii.
M.	F. haust.	Sig.: Give at once.		

Mixture for Colic with Flatulency in the Dog.

R	Magnesii carb.	...	...	̄i.ss.
	Ammonii carb.	...	...	̄ss.
	Spts. chloroformi	...	...	̄i.
	Tinct. cardamomi co.	...	...	̄ii.
	Aquæ menth. pip.	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every two hours as required.

Mixture for Puppies suffering from Colic and Flatulent Distension.

R	Pulv. rhei co.	...	...	̄i.
	Spts. ammonii aromat.	...	...	̄ss.
	Tinct. cardamomi co.	...	...	̄iii.
	Spts. chloroformi	...	...	̄ss.
	Aquæ menth. pip.	...	...	ad ̄i.ss.

F. m. Sig.: Give from half a teaspoonful to two teaspoonfuls (according to the size of the animal) every hour until relieved.

Or:

R	Magnesii carb.	...	...	grs. xx.
	Syrupi zingiberis	...	...	̄iii.
	Spts. chloroformi	...	...	℥ xx.
	Aquæ menth. pip.	...	...	ad ̄ii.

F. m. Sig.: Give from half a teaspoonful to one teaspoonful every hour as required.

Mixture for Enteritis in the Dog.

R Bismuthi subnit.	...	...	℥ss.
Sodii salicylatis	...	...	℥iii.
Tinct. camph. co.	...	...	℥vi.
Mucilaginis tragacanthæ	...	...	℥i.ss.
Aquæ menth. pip.	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every three or four hours as required.

Sedative Powders for Enteritis.

R Bismuthi subnit.	...	...	grs. x. to grs. xx.
Pulv. ipecac. co.	..	...	grs. v. to grs. x.

F. pulv. i. Sig.: Give one every three hours as required.

Mixture for Habitual Constipation in the Dog.

R Ext. cascariæ sagradæ liquidî	...	...	℥ii.
Tinct. nucis vom.	...	...	℥ii.
Tinct. belladonnæ	...	...	℥ii.
Glycerini	...	...	ad ℥iv.

F. m. Sig.: Give a teaspoonful every morning and evening. For small dogs reduce this dose by half.

Pills for Habitual Constipation in the Dog.

R Aloini	...	...	grs. iv.
Strychninæ sulph.	...	...	gr. $\frac{1}{5}$.
Ext. belladonnæ	...	...	grs. i.ss.
Pulv. ipecac.	...	...	grs. vi.
Ext. gentianæ	...	...	q.s.

M. Div. in pil. xii. Sig.: Give one twice a day. For dogs of large size, double these doses may be given.

Powders for Habitual Constipation in the Dog.

R Magnesîæ calc.	...	...	℥i.
Sulphuris præcip.	...	...	℥i.
Potassii tart. acidi	...	...	℥ss.

M. Div. in pulv. xii. Sig.: Give one twice a day in the food. In the case of large dogs the doses may be doubled.

Castor-Oil Emulsion for the Treatment of Diarrhœa in Puppies when Irritating Ingesta are present in the Intestines.

R Ol ricini	...	...	℥vi.
Pulv. tragacanthæ co.	...	...	℥i.
Syrupi	...	...	℥iv.
Aquæ menth. pip.	...	...	ad ℥iii.

F. m. Sig.: Give from one teaspoonful to a dessert-spoonful (according to size and age of animal) every two hours until relieved.

Mixture for Diarrhœa in the Dog depending on Excessive Acidity of the Intestinal Contents.

R	Sodii bicarb. ... ..	...	...	̄i.
	Spts. ammon. aromat. ... ..	...	...	̄iii.
	Tinct. cardamomi co. ... ..	...	...	̄vi.
	Aquæ cinnamomi ... ..	...	...	ad ̄vi.

F. m. Sig.: Give from a dessertspoonful to two table-spoonfuls every three hours until relieved.

Bismuth and Opium Mixture for Diarrhœa in the Dog accompanied by Intestinal Pain and Irritation.

R	Bismuthi carb. ... ..	...	...	̄i.ss.
	Cretæ præp. ... ..	...	...	̄ii.ss.
	Sodii bicarb. ... ..	...	...	grs. xl.
	Spts. ammon. aromat. ... ..	...	...	̄iv.
	Liq. opii sed. ... ..	...	...	℥ xx.
	Mucilaginis tragacanthæ ... ..	...	...	̄ii.
	Aquæ chloroformi ... ..	...	...	̄ii.
	Aquæ cinnamomi ... ..	...	...	ad ̄viii.

F. m. Sig.: Give from a dessertspoonful to two table-spoonfuls every three hours until relief is obtained.

Mixture for Obstinate Cases of Diarrhœa in the Dog.

R	Acidi sulph. dil. ... ..	...	...	̄iv.
	Decocti hæmatoxyli ... ..	...	...	̄v.
	Infusi carophylli ... ..	...	...	̄iv.
	Aquæ menth. pip. ... ..	...	...	ad ̄x.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful, according to the size of the dog, three times a day.

Mixture for Diarrhœa in Puppies.

R	Bismuthi carb. ... ..	...	...	grs. xl.
	Tinct. camph. co. ... ..	...	...	̄i.
	Glycerini ... ..	...	...	̄ss.
	Mucilaginis ... ..	...	...	̄ss.
	Aquæ chloroformi ... ..	...	...	ad ̄iii.

F. m. Sig.: Give from half to one teaspoonful every three hours until the purging is lessened.

Astringent Mixture for Dysentery in the Dog.

R Bismuthi carb.	...	...	...	℥ss.
Pulv. ipecac. co.	...	...	...	℥i.
Magnesii carb. levis.	...	...	...	℥i.
Mucilaginis tragacanthæ	...	...	...	℥i. ss.
Aquæ menth. pip.	...	...	...	ad ℥vi.

F. m. Sig.: Give from a dessertspoonful to a table-spoonful three times a day.

Or:

R Tinct. chloroformi et morphinæ co.	...	...	...	...	℥ii.
Vini ipecac.	...	...	...	...	℥ss.
Liq. bismuthi	...	...	...	...	℥ss.
Aquæ camphoræ	...	...	...	...	ad ℥vi.

F. m. Sig.: Give from a dessertspoonful to a table-spoonful three times a day.

CHAPTER IX

THE TREATMENT OF DISEASES OF THE LIVER

IN veterinary practice the diagnosis of hepatic affections is attended with considerable difficulty, as the symptoms presented are often neither well-marked nor suggestive. The evidence afforded by autopsies teaches us that even far-advanced lesions of the liver may be present without furnishing diagnostic symptoms.

We also learn from clinical experience that the symptom known as jaundice or icterus may be absent in a large number of cases. No doubt when present this symptom is very suggestive, but it does not enable us to differentiate the various forms of hepatic affections that may occur in animals. Seeing, then, the difficulties in diagnosis, it is apparent that the treatment of diseases of the liver cannot always be carried out in a satisfactory manner. In chronic hepatic affections depending on organic changes the influence of the therapist will of necessity be very limited, even though it were possible to arrive at a correct diagnosis. It is in the case of hyperæmic conditions and certain functional disorders of this organ that we are able to adopt therapeutic measures likely to be of benefit to the patient.

In order to prescribe rational treatment it is necessary to be acquainted with the immediate results of liver disease, and also with the secondary or remote results. To appreciate these an intimate knowledge of the physiology of this organ is requisite, as well as an acquaintance with the pathology of hepatic affections. When the important and varied

functions of the liver are disordered or interfered with by disease, the results on the system, although not always appreciated or ascribed to their correct cause, must nevertheless be serious, especially if continued for any length of time.

We have to consider the detrimental effects of interference with the biliary and glycogenic functions of this organ, and also to be aware of the part the liver plays as an eliminator of waste products. The latter is believed to depend on a special action which the gland exerts in the reduction of albuminoids—*i.e.*, it deoxidises and reduces them into simpler compounds, which can be more readily dissolved and eliminated. When this function is impaired or arrested by an hepatic affection, the production of urea is decreased, and less of this substance is found in the urine.

The secondary or remote results of liver disease are of great importance from a therapeutical point of view. Of these, derangements of the digestive organs and of the nervous and circulatory systems are of chief interest. Diminished secretion of bile tends to produce constipation, a clay-coloured foetid condition of the fæces, and intestinal fermentation.

When the hepatic circulation is torpid, the whole portal system becomes congested. This leads to indigestion and allied affections. As the result of the circulation in the blood of the morbid products arising from interference with the function of the liver, certain effects are produced on the nervous system, such as dulness, depression, sleepiness, muscular weakness, a slow pulse, etc. In some instances lameness attributable to the right shoulder may occur, probably reflex in origin. This symptom is, however, seldom met with.

In cirrhosis of the liver, the resulting interference with the portal circulation induces ascites and gastric catarrh.

Inactivity or disorder of the liver may give rise to irritation of the skin, or to various forms of cutaneous affections. These probably result from the presence of irritant products circulating in the cutaneous vessels or being excreted by the

sweat-glands. Degenerative diseases of the kidneys may also result from hepatic affections, as imperfect liver function may produce renal irritation, the effete products arising from the former having to be eliminated by the kidneys.

Hepatic affections are more commonly met with in the sheep and dog than in the horse and ox; it is extremely probable, however, that in all animals many cases of liver disorder are overlooked in consequence of the lack of diagnostic symptoms.

In the treatment of liver affections it is of importance to ascertain the pathological condition with which we have to deal. Needless to say, this is not always possible, so that we are forced to direct our attention to the prominent symptoms that present themselves, and to adopt measures to overcome or to alleviate them. These measures will consist of attention to diet, the administration of cholagogue cathartics to clear out the intestines and cause removal of the bile therefrom, and the judicious employment of hepatic stimulants when such are indicated. The secondary or remote results of liver disorder will also require attention, the suitable treatment of which requires much care and deliberation.

The indiscriminate employment of liver stimulants must be condemned, as in certain affections—*e.g.*, catarrh of the bile-duct and biliary congestion—there is an obstruction to the passage of bile to the intestine, and such agents tend to increase the diseased condition.

The Treatment of Congestion of the Liver.

This disease may be either *active* or *passive*. The *active* form consists of hepatic engorgement, with some enlargement and tenderness of the organ. It is far more commonly met with in tropical than in temperate climates. The recognised causes of this condition are: insufficient exercise, too high feeding, exposure to cold after severe work, and the action of toxic matters produced by infectious diseases, especially those affecting the intestinal canal.

The symptoms indicative of this condition are by no means

well marked. In the horse the following may be present: dulness, slight abdominal pain, a tendency to look towards the right side, tenderness on percussion over the region of the liver, slight yellowness of the conjunctiva, high-coloured urine, constipation, the fæces pale in colour and very fœtid, a sour, acid condition of the mouth, grinding of the teeth, loss of appetite, excessive acidity of the stomach, evidenced by the animal licking the walls of his stall; there may also be thirst and slight febrile symptoms, and occasionally lameness attributable to the right shoulder.

In the dog evidences of gastric catarrh may be present, a coated tongue, loss of appetite, offensive breath, flatulent distension, and general malaise. Occasionally vomiting may occur, and the attack may be ushered in by rigors. In some cases constipation is present, in others slight diarrhœa may occur. Occasionally a slight icteric tint of the conjunctiva and urine may be observed.

If from want of exercise and overfeeding frequent attacks of hepatic congestion are induced, organic changes occur in the liver.

The *passive* form of hepatic congestion occurs in the clinical course of chronic valvular cardiac disease and of advanced pulmonary emphysema, and in all morbid states of the heart or lungs which lead to stasis of blood in the right side of the heart and interfere with its free outflow therefrom.

This condition is sometimes known as 'cardiac liver,' and the term 'nutmeg liver' is applied to the pathological appearances which are found on post-mortem examination of the organ in such cases. In this form, gastro-intestinal catarrh, ascites, slight jaundice, and high-coloured, scanty urine, containing bile pigments, are the symptoms usually met with, in addition to those of the primary disease of which it forms a part.

The *treatment* of the active form of hepatic congestion in the horse will consist in relieving the hyperæmia of the portal vessels by the administration of suitable aperients; these will also clear out the bile-channels. An aloetic purgative com-

bined with calomel is indicated. When the action of the physic has subsided, moderate doses of sulphate of soda or sulphate of magnesia, with full doses of bicarbonate of soda, should be administered either in the food or drinking-water twice daily. Laxative food should be ordered and corn withheld, water allowed *ad lib.*, and a proper amount of walking exercise given after the acute stage has passed.

In the dog a similar line of treatment is indicated—a moderate dose of calomel, combined with the compound colocynth and hyoscyamus pill. This should be followed up with salines, such as bicarbonate of soda. The food should be restricted to fluids, such as milk, thin gruel, light broth, etc., and after the acute symptoms have disappeared a light diet should be ordered for some time. As this affection usually occurs in pampered dogs, it is important to advise sufficient exercise, and, if possible, to alter the mode of living, as otherwise repeated attacks will probably lead to the occurrence of organic changes in the liver.

In chronic cases of hepatic congestion mild aperients will prove of benefit, and the judicious employment of liver stimulants, such as euonymin and ipecacuanha, will be indicated.

Passive congestion of the liver, being a consequence of other diseases, must be treated according to its cause. Needless to remark, in this form, depending as it does on some serious cardiac or pulmonary disease, it will not be advisable to attempt treatment in the horse.

In the case of favourite dogs, however, treatment, although but palliative, must be adopted. Purgatives to relieve the congestion of the abdominal veins are necessary, and the judicious use of digitalis will be indicated (see formula, p. 510). The other symptoms must receive appropriate attention as they arise. Many of these cases when brought for treatment will be far advanced, and, of course, hopeless as regards results.

Some authorities recognise a third form of hepatic congestion, which consists of engorgement of the organ with bile. This is believed to depend on tumefaction of the

lining membrane of the bile-ducts. The result is that the bile, being prevented from flowing freely into the duodenum, accumulates in the liver, and is absorbed into the circulation, giving rise to the condition known as jaundice, and to the other symptoms that may be present in cases of hepatic congestion. This form is said by some practitioners to occur as a complication of influenza in the horse, and has been termed 'bilious fever.' The suitable treatment is to administer sulphate of soda or sulphate of magnesia in the drinking-water, and with these the bicarbonate of soda may be alternated with advantage (see formula, p. 509). The latter agent tends to overcome the excessively acid condition of the stomach that is often present in these cases, and it is also believed to promote a flow of thin bile into the intestine.

The Treatment of Hepatitis, or Inflammation of the Liver.

Most authorities agree that the diagnosis of this condition is very seldom possible. Post-mortem examinations have revealed the presence of pathological changes occurring in the liver, although no symptoms pointing to their existence were observed during life.

The symptoms in some instances are similar to those mentioned as occurring in cases of acute hepatic congestion. According to those who have had experience of the affection in hot climates, pain of a dull character and febrile symptoms are more marked, also tenderness over the region of the liver and an increased area of dulness. Lameness attributable to the right shoulder is only an occasional symptom. Attempts have been made by some authors to differentiate the diagnosis of the various forms of hepatitis, such as parenchymatous, suppurative, hepatic abscess, perihepatitis; but from a clinical point of view the results have proved of no practical value, and the conditions are of more interest from a pathological than from a therapeutical aspect.

The treatment of such affections will of necessity depend on the symptoms that are presented. Generally speaking,

it will consist of promoting a free action of the bowels and kidneys by the administration of aloes and calomel, followed up with sulphate of soda. A properly regulated diet will also be necessary. Counter-irritants to the region of the liver are recommended by some authorities.

In the dog, acute hepatitis is seldom met with in temperate climates. The diagnosis of this affection is attended with considerable difficulty, as the symptoms may not point to the liver as being the seat of disease. All the symptoms of the active form of hepatic congestion may be present, but in a more marked degree. Persistent vomiting is usual, and jaundice may appear in the early stages. Discomfort, sometimes amounting to actual pain, and lying on the chest and belly are symptoms also observed. Recovery may occur from a primary attack, or an abscess may form in the liver, or chronic hepatitis may result.

The presence of local tenderness and an increase in size of the liver, judged by palpation, will be of assistance in diagnosis. The stereotyped symptoms given by some authors will not, however, prove of clinical value, and at best we can only suspect the presence of an hepatic affection, and treat the symptoms as they arise.

The principles of treatment are similar in the majority of cases of hepatic affections in the dog :

1. To remove effete materials from the system by the administration of a purgative, and for this purpose either calomel or blue pill is most effectual. The popular idea that calomel increases the secretion of bile is erroneous. By its purgative action it clears out bile from the duodenum, and may indirectly induce the secretion of fresh bile ; but it has no direct stimulating effect on the liver.

2. To relieve the gastric irritability by the administration of salines, combined with bismuth if vomiting be troublesome. Attention to diet is of importance, light, unirritating foods only being allowed. Small doses of blue pill with ipecacuanha are recommended by some authorities in cases that tend to assume a subacute form. Half a grain of the former with $\frac{1}{4}$ grain of the latter may be given three or four times

daily. If there is distinct tenderness and enlargement over the region of the liver, a mild application of mustard paste, followed up with linseed poultices, may give a certain amount of relief.

The Treatment of Chronic Hepatitis, or Cirrhosis of the Liver.

The treatment of this affection is unsatisfactory in all animals. Having to deal with serious organic alterations in the structure of the liver, resulting in obstruction of the branches of the portal vein and of the bile-ducts to a certain degree, with atrophy and destruction of a considerable portion of the liver-cells, it follows that the influences which the therapist will be able to exert are very limited. This affection is rarely met with in the horse, but is more common in the dog. The symptoms in the horse are often obscure.

In addition to the usual symptoms which may suggest disease of the liver, emaciation, ascites, great thirst, an irritable condition of the gastro-intestinal canal, distension of the abdomen, and general debility, may be present. Jaundice may be absent, but a slight icteric tinge of the visible mucous membranes is often observed. Cases are recorded in which hepatic cirrhosis occurred in two mares and a foal 'resulting from an insufficient supply of food, which was also of bad quality' ('Principles and Practice of Veterinary Medicine,' Williams).

In the horse it is clear that, when the disease is established, treatment cannot prove satisfactory. Remembering the difficulties in diagnosis, however, it will be prudent to avoid hasty conclusions as to the existence of an affection that is beyond the limits of treatment. Hence in many instances we are justified in attempting treatment in the earlier stages, and our efforts should be directed to the prominent symptoms that present themselves.

Full doses of sulphate of soda may be given to clear out the intestines, and to exert a depleting influence on the liver and portal circulation. Bicarbonate of soda is also indicated,

and salicylate of soda has been found useful in some cases. In others, the administration of dilute nitro-hydrochloric acid has proved of some value. Iodide of potassium is said to be useful by some authorities. It is believed by them to have some influence in checking the advance of the sclerosing processes in the liver, and its diuretic action may also be of advantage.

In the dog cases of hepatic cirrhosis more frequently come under the notice of the practitioner. In favourite animals treatment must be adopted, but it should be clearly impressed on the owner that the disease is an incurable one, and that all our efforts can only result in alleviating the symptoms and prolonging life for a time.

The course of the disease is very insidious, and beyond attacks of indigestion, dulness, and progressive emaciation, we do not observe any symptoms in the early stage which point to the liver as the seat of disease. Emaciation and distension of the abdomen lead us to make a physical examination.

The liver in the early stages is found enlarged; later on it becomes reduced in size, the result of contraction of the newly-formed interstitial connective tissue.

Gastro-intestinal catarrh, vomiting, loss of appetite, scanty and high-coloured urine, thirst, a rough and scaly skin, furred tongue, offensive breath, ascites, constipation, etc., are some of the prominent symptoms observed in this affection. Slight jaundice may appear in some cases, but more frequently it is absent.

The treatment is usually unsatisfactory, especially in advanced cases. The gastric irritability which is so frequent a symptom renders the administration of saline aperients difficult, as vomiting is apt to be induced.

It is of importance to secure regular depletion of the engorged portal vessels by the administration of suitable purgatives.

A combination of podophyllin with extract of aloes, $\frac{1}{8}$ to $\frac{1}{4}$ grain of the former with 1 or 2 grains of the latter, given in the form of a pill every second day, and followed up by the

daily administration of a mixture containing sulphate of soda and bicarbonate of soda, is often serviceable for this purpose. If nausea and vomiting are prominent symptoms, a mixture containing liquor bismuth, bicarbonate of soda, and small doses of dilute hydrocyanic acid or aqua laurocerasi should be prescribed.

Ascites should be treated by tapping, which gives temporary relief, but unfortunately the condition rapidly recurs. This should be followed up by the administration of diuretics, to assist in the removal of the ascitic fluid.

A pill containing $\frac{1}{4}$ grain of calomel and 1 grain each of digitalis and squill may be given twice daily, the calomel not only exerting a favourable influence on the hepatic affection, and acting as an intestinal antiseptic, but also as a diuretic.

When the stomach is very irritable, $\frac{1}{4}$ grain of calomel with 3 grains of caffeine may be substituted for the above.

If obstinate vomiting be present, we have seen good results from the administration of chloretone in doses of 5 to 10 grains: it is best given in the form of a powder placed on the back of the tongue, and it may be repeated at intervals of three hours until relief is obtained.

Iodide of potassium, in carefully regulated doses, so as not to produce irritation of the stomach, may be given, with a view to checking the course of the morbid process in the liver; it also proves of benefit by its diuretic action.

Attention to diet is of great importance: light foods easy of digestion and assimilation should be ordered. Milk suits well if the patient will take it voluntarily. In order to render it more easily assimilated, small amounts of bicarbonate of soda may be added.

If food has to be forced on the animal, there is usually very little hope of any success from treatment.

The Treatment of Jaundice.

Jaundice is a condition in which the skin and visible mucous membranes become stained yellow, as the result of the presence of bile pigment in the general circulation. It may occur, not only in hepatic affections, but also during

the course of other diseases, and it must in reality be regarded rather as a symptom than as a distinct affection. Nevertheless, there are conditions associated with it which justify us in considering its treatment under a special heading.

Two forms of jaundice are recognised :

1. Jaundice from *obstruction*, also termed the hepatogenous form. This results from obstruction of the outflow of bile along the biliary ducts, so that it is prevented from entering the duodenum, and thus becomes reabsorbed into the blood. The commonest cause of this form is said to be an inflammatory catarrhal condition of the common duct, or a swelling and obstruction of the opening of this duct in the duodenum, usually arising in connection with a catarrhal inflammation of the stomach and duodenum.

According to some authorities, a chill may induce a catarrhal condition of the bile-duct, in the same manner as it may cause vesical or intestinal catarrh.

Amongst occasional causes of jaundice from obstruction we may mention the presence of biliary concretions, a plug of mucus temporarily obstructing the duct, the presence of an intestinal worm producing the same effect, pressure on the bile-duct by malignant tumours, and many other conditions seldom met with in veterinary practice. When jaundice occurs in connection with cases of hepatic congestion and cirrhosis, it is probably of obstructive origin.

2. The other form of jaundice is known as hæmatogenous. It does not depend on obstruction and reabsorption of bile, but on certain blood-changes, the nature of which has not yet been determined in a definite manner. Some authorities believe that the presence of certain toxins or poisons in the blood, by interfering with the normal metamorphosis of bile, may induce this form of jaundice. Deficient oxygenation of the blood is said to produce a similar effect. This condition was at one time termed jaundice from suppression, but modern authorities are doubtful as to whether any form of jaundice is due to a suppressed secretion of bile.

The jaundice in these cases is believed by some authorities

to depend on increased destruction of red blood-corpuscles; the hæmoglobin being set free in large amount, is changed into a bile pigment, which, not being eliminated as quickly as it is formed, accumulates, and is deposited in the tissues of the body. This condition may be met with in cases of acute yellow atrophy of the liver, in some of the specific fevers, in malarial conditions, and it also occurs in young dogs, constituting that very fatal affection known as malignant jaundice of sporting dogs. This latter disease we shall again refer to.

From a therapeutical point of view, it is of importance to differentiate clinically these forms of jaundice, but this is not always possible, as there are no reliable distinguishing features with which we are acquainted.

The earlier authorities taught that the diagnosis of jaundice due to obstruction could be determined by an examination of the urine. If bile acids were found to be present, the case was regarded as due to obstruction; if they were absent, the jaundice was attributed to what was termed suppression of bile, and not to reabsorption.

In the present day, however, this method of diagnosis is not regarded as of any practical value. Bile acids have been found in the urine in cases of acute yellow atrophy of the liver, while in some cases of jaundice due to obstruction they have been absent.

According to some authorities, the ordinary test for bile acids in the urine is a very uncertain one. A more reliable diagnostic feature is afforded by an examination of the fæces.

In cases not depending on obstruction of the bile-ducts the stools contain bile, and are thus of a normal colour. In cases of jaundice depending on obstruction the stools are clay-coloured, in consequence of the absence of bile. This test also is not free from fallacy.

Jaundice which appears gradually and is persistent is most probably independent of obstruction. When depending on obstruction it speedily becomes intense.

A history of previous attacks of jaundice points to a catarrhal origin; while in a young animal, if the condition

is preceded by an attack of gastric catarrh, a similar origin is probable. When occurring suddenly in an animal previously healthy, and accompanied by symptoms of acute pain, with clay-coloured stools, the cause is probably a biliary concretion in the duct.

It must be remembered, however, that biliary concretions are comparatively rare in animals, and that in some instances jaundice may be absent in this condition. Some authorities state that jaundice may be caused by an excess of bile, which becomes reabsorbed.

It will thus be seen that the differentiation of these forms of jaundice is attended with considerable difficulty, and as a result treatment is not always satisfactory.

In the horse it cannot be said that jaundice is of frequent occurrence, and we know that in many far-advanced cases of hepatic disease it may be absent. When occurring in connection with influenza its origin is doubtful, some authorities stating that it arises from a catarrhal condition of the bile-ducts, while others deny this.

The symptoms accompanying jaundice are very similar to those already described as suggestive of liver disorder. If the jaundice is not well marked, it will be wise to examine the urine for the presence of bile pigment and bile acids. Indeed, in all cases of an obscure nature the presence of these abnormal constituents in the urine will lead us to suspect an hepatic disorder.

The test for bile pigment, known as Gmelin's test, is carried out as follows :

On to the surface of a small quantity of fuming nitric acid (containing nitrous acid) in a test-tube allow a little of the suspected urine to trickle by means of a pipette. If bile pigment be present we see at the zone of contact a green ring, and below this a play of colours; but the green ring is the most constant, and the only certain sign of the presence of bile, as the other colours may be developed in the absence of jaundice, and may be seen when indican is present.

A similar play of colours may be obtained by allowing

a drop of urine containing bile and a drop of nitric acid to run together on a white plate, but the green colour is not so distinctly seen.

The test for bile acids is known as Pettenkofer's test, and is carried out as follows :

To a test-tube half full of strong sulphuric acid add a few grains of grape-sugar, or a small amount of solution of cane-sugar, and float a little of the suspected urine on to the surface of the mixture. A purple or violet colour at the line of junction indicates the presence of bile acid.

The treatment of jaundice in the horse must be conducted on general principles. The indications are to secure elimination of effete materials by acting on the bowels and kidneys, and to prevent the formation of injurious toxins. Calomel in properly regulated doses is the agent that gives the best results, and this may be followed up by the administration of sulphate of soda. If we are satisfied that the liver is inactive, dilute nitro-muriatic acid in doses of 1 drachm may be given three times daily in the drinking-water. In other cases full doses of bicarbonate of soda produce beneficial results. It is impossible to lay down hard-and-fast rules for the treatment of this condition; so much depends on the nature of the affection of which it is a symptom.

Jaundice in the dog is of far more frequent occurrence than in the horse, and more fatal in its results.

As already mentioned, it may be a symptom occurring in various forms of hepatic affections, and in the catarrhal form it results from extension of the inflammatory action from the stomach and duodenum to the common bile-duct. Jaundice may also be due to microbic infection entering the bile-ducts from the intestine.

Among other causes may be mentioned intussusception, the presence of intestinal parasites or of a biliary concretion in the bile-duct, and malignant tumours causing pressure on the biliary ducts. Over-exertion, fatigue, and chill have been brought forward as causes, but their influence is doubtful. As a correct diagnosis of these conditions

is not always possible, it follows that in many instances we are forced to treat the prominent symptoms that are present.

Prior to the appearance of the characteristic yellow coloration of the visible mucous membranes, the eyes, and the skin (in light-coloured animals), a dull, sleepy condition may be observed; also loss of appetite, vomiting, thirst, an irritable skin, and a dry staring coat. As the bile exerts its toxic effects on the system the gastric irritability becomes more marked, and distressing vomiting occurs, with great prostration of strength, a slow pulse, and occasionally abdominal pain. In cases of jaundice depending on obstruction, the fæces are pale in colour, and very foetid, and either constipation or diarrhœa may be present, but generally the former condition.

The vomited material is of a greenish colour, and in extreme cases may contain traces of blood. Food of all kinds is refused, and if forced on the animal it is quickly rejected by vomiting. The urine is scanty and high-coloured; it contains bile pigments, and probably bile acids.

In severe cases there is a tendency to hæmorrhage from the gums, nostrils, and intestines. Cholæmia, or bile intoxication, may also produce convulsions, terminating in fatal coma, or a drowsy condition, developing into a semicomatose one, may be present.

The treatment of jaundice in the dog is often unsatisfactory, as it is difficult to ascertain its origin. We should endeavour, if possible, to arrive at a conclusion as to whether the case is of obstructive origin or one of the hæmatogenous forms to which we shall presently refer. The possible methods of differentiation we have already mentioned.

A moderate dose of calomel should be administered, and a mixture containing bismuth and bicarbonate of soda prescribed three times daily. Should vomiting be obstinate and the above be rejected, chloretone should be given in doses of 5 to 10 grains, and is best administered in the form of a powder placed on the back of the tongue. Unless the vomiting is relieved, neither medicines nor food can be

retained, and a fatal termination may be looked for. We have seen chloretone succeed in checking the gastric irritability when all other agents had failed in this respect.

In some cases small doses of calomel repeated at intervals give satisfactory results; from $\frac{1}{4}$ to $\frac{1}{2}$ grain may be given three times daily, according to the size of the dog, or small doses of the hydrargyrum cum creta may be substituted for this.

In others the alkaline treatment, together with the administration once daily of a pill containing euonymin grs. i.ss., iridin gr. i., ipecacuanha $\frac{1}{4}$ gr., and compound pill of colocynth and hyoscyamus grs. ii., succeeds.

The food should be light and easily digested. Milk and lime-water should be freely allowed, and if it is found necessary to force food on the patient, Brand's Essence of Beef is to be preferred for the purpose, as it is the most likely form of nourishment to be retained.

Jaundice is said by some authorities to occur as a sequel to canine distemper, while others state that it is a rare complication of this disease.

A very fatal form of jaundice occurs in young dogs, especially in the sporting varieties, large numbers being attacked in the same kennel. It has been termed malignant or specific jaundice, and Mr. Henry Gray, M.R.C.V.S., Kensington, regards it as depending on hæmal infection resulting from the presence of ticks on the animal. He advises the administration of the acid hydrochlorate of quinine by hypodermic injection, also intravenous injections of normal saline solution.

In the *Veterinarian*, August, 1897, this eminent authority contributes an instructive article on the 'Treatment of Jaundice in the Dog.' He states that in his experience jaundice does not depend on gastro-duodenal catarrh or inflammation, and the usual treatment was not successful in his hands. The treatment he recommends is a combination of tinctura cinchonæ composita, and liquor hydrargyri perchloridi, prescribed as follows:

R	Tinct. cinchonæ co. ...	...	ʒi.
	Liq. hydrarg. perchlor. ...	...	ʒi.
	Syr. rhamni ...	...	ʒii.
	Aquæ chloroformi ...	...	ad ʒi.
M.	F. haust.	Sig.: To be given every four hours for the first day, and on the following days every morning, noon, and night.	

When purgation sets in the syrup rhamni must be omitted. The above doses are suitable for a dog of the size of a fox-terrier.

Mr. Gray advises the addition of tincture of digitalis and aromatic spirit of ammonia should the pulse become very weak and infrequent and the temperature descend very much below the normal. If drowsiness of the patient is severe, nux vomica or caffeine is advised.

Before commencing treatment he considers it advisable to administer $\frac{1}{15}$ to $\frac{1}{10}$ grain of apomorphine hypodermically, so as to empty the stomach of its contents, to remove the thick mucus, and probably to empty the gall-bladder; and he finds that the secondary action of the drug prevents the retching which is so frequent and distressing during the earlier stage of the malady.

He also draws attention to a constant lesion found in this affection—viz., ‘the presence of multiple hæmorrhages in the substance of the lungs, which may coalesce and give the entire lung a congested appearance.’

There are a number of morbid conditions of the liver, the existence of which is only ascertained post-mortem; hence they are of more interest from a pathological than from a therapeutical point of view.

A form of hepatic affection termed ‘biliary fever of horses in India’ is described by Lieutenant S. F. Pallin, A.V.D., in the *Veterinary Journal*, January, 1905.

It is believed to depend on the presence of a piro-plasma in the blood, and post-mortem evidence shows that there is no obstruction to the flow of bile into the intestine.

The treatment advised is the administration of a ball containing $\frac{1}{2}$ ounce of ammonium chloride and $\frac{1}{2}$ drachm of belladonna extract every eight hours, and from 3 to 4

ounces of magnesium sulphate once daily in the drinking-water.

FORMULÆ.

Saline Laxative Powders (artificial Carlsbad Salts) in the Treatment of Hepatic Affections of the Horse.

R Sodii sulph. exsicc. $\bar{5}$ v.ss.
 Potassii sulphatis $\bar{5}$ ii.
 Sodii chlor. $\bar{5}$ ii.ss.
 Sodii bicarb. $\bar{5}$ iv.ss.

M. Div. in pulv. vi. Sig.: Give one twice a day, dissolved in the drinking-water.

Pills for Chronic Congestion of the Liver in the Dog.

R Aloes Barb. grs. i.ss.
 Euonymin grs. ii.
 Pulv. ipecac. gr. ss.
 Excipient. q.s.

M. F. pil. i. Mitte xii. Sig.: Give one every day.

Pills for Subacute Hepatitis in the Dog.

R Pil. hydrargyri gr. i.
 Pulv. ipecac. gr. ss.
 Excipient. q.s.

F. pil. i. Mitte xii. Sig.: Give one three or four times daily.

Mixture for Gastric Irritability and Vomiting in Chronic Hepatitis in the Dog.

R Bismuthi subnit. $\bar{5}$ ss.
 Ac. hydrocyanic. dil. ℥ xxxvi.
 Mucilaginis q.s.
 Aquæ chloroformi ad $\bar{5}$ vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every three hours, as required.

Pills for Ascites in Connection with Hepatic Cirrhosis in the Dog.

R Hydrarg. subchlor. gr. $\frac{1}{4}$.
 Pulv. digitalis gr. i.
 Pulv. scillæ gr. i.
 Excipient. q.s.

F. pil. i. Mitte vi. Sig.: Give one twice daily. (The doses of the above must be graduated according to the size of the dog.)

Diuretic Mixture in Cases of Ascites depending on Hepatic Cirrhosis in the Dog.

R	Potassii acet. ...	...	...	̄vi.
	Spts. æth. nit. ...	...	...	̄vi.
	Spts. juniperi ...	...	...	̄vi.
	Infusi digitalis ...	...	...	̄iii.
	Aquæ ...	...	...	ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times a day.

Or:

R	Tinct. digitalis ...	...	...	̄ii.
	Tinct. scillæ ...	...	...	̄iv.
	Potassii acet. ...	...	...	̄iv.
	Potassii iod. ...	...	...	̄i.
	Syr. aurantii ...	...	...	̄ii.
	Aquæ ...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times a day.

Powders for Ascites when Gastric Irritability is Present.

R	Hydrarg. subchlor. ...	...	gr. $\frac{1}{4}$.
	Caffeinæ cit. ...	...	grs. ii.

M. F. pulv. i. Mitte vi. Sig.: Give one twice daily on the back of the tongue.

Pills for the Treatment of Jaundice.

R	Euonymin ...	...	gr. i.
	Iridin ...	...	gr. i.
	Pulv. ipecac. ...	...	gr. $\frac{1}{4}$.
	Pil. colocynth. et hyoscyami	...	grs. ii.

M. F. pil. i. Mitte vi. Sig.: Give one every day.

Pills for Jaundice in Puppies.

R	Hydrarg. c. creta ...	...	gr. ss.
	Sodii bicarb. ...	...	grs. iii.

M. F. pil. i. Mitte xii. Sig.: Give one three times a day.

Mixture for Jaundice in the Dog.

R	Liq. hydrarg. perchloridi ...	...	̄ii.
	Tinct. cinchonæ co. ...	...	̄ii.
	Syr. rhamni ...	...	̄iv.
	Aquæ chloroformi ...	...	ad ̄viii.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every four hours for the first day, and on the following days give every morning, noon, and night.

Tonic Mixture during Convalescence from Jaundice.

℞	Quininæ sulph.	...	...	grs. xxiv.
	Liq. strychninæ	...	...	℥ xxxvi.
	Ac. nitro-hydrochlor. dil.	...	...	ʒii.
	Tinct. gent. co.	...	...	ʒvi.
	Syr. aurantii	...	...	ʒii.
	Aquæ	...	...	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times daily.

CHAPTER X

THE TREATMENT OF DISEASES OF THE URINARY ORGANS

The Treatment of Renal Affections.

RENAL affections are not so frequently met with in veterinary as in human practice. It is very probable, however, that, in consequence of the obscurity of the symptoms presented, cases of this nature are not always recognised. On the other hand, it may happen that an erroneous diagnosis of renal disorder may be given, when in reality the kidneys are not the seat of any disease. Owners and attendants of horses ascribe a large number of affections to the kidneys; in fact, this seems a very popular form of diagnosis. It must be distinctly understood that a chemical and microscopical examination of the urine is the only reliable means of proving the presence or absence of a renal affection. No doubt there are certain symptoms that when present are suggestive of the existence of kidney disease, but they are not constant, and cannot be relied on as diagnostic.

The Treatment of Congestion of the Kidneys.

Some authors attempt to differentiate between renal congestion and acute nephritis or inflammation of the kidneys. Clinically such a distinction is seldom possible, nor is it of importance, as the treatment in both cases is very similar.

Active congestion of the kidneys is the first stage of acute nephritis, and the symptoms presented will not enable us to distinguish between the two conditions. In acute renal

congestion the urine on examination may be found to contain albumin, blood, or blood-colouring matter; it is scanty in amount and of high specific gravity.

Mild forms of renal congestion are met with, which tend to recover in a few days with simple treatment, the symptoms presented being stiffness in the hind-limbs during progression and a scanty secretion of urine. The administration of a mild purgative, such as raw linseed-oil, followed up with sulphate of magnesia and bicarbonate of soda in the drinking-water, warm clothing, and light diet, constitute the therapeutical measures necessary.

Passive congestion of the kidneys occurs in connection with disease of the right side of the heart.

The Treatment of Acute Nephritis.

Acute nephritis, also known as acute Bright's disease, is a very serious affection, and is not of frequent occurrence in any of our patients. It is very probable that many cases which are diagnosed as nephritis, and recover, were in reality those of renal congestion which did not proceed to the inflammatory stage.

Similar causes may produce renal congestion and nephritis, and those usually accepted are as follows: The introduction of irritants into the system, such as too large doses of oil of turpentine, and the pernicious custom indulged in by some attendants of horses of constantly administering large amounts of diuretic agents. The absorption of cantharidin, resulting from the too extensive application of a cantharides blister, may also produce nephritis.

Cold and damp and exposure after exertion are also recognised as causes. Violent muscular exertion is stated by some authorities to be a factor in the production of nephritis, but this is denied by others.

Nephritis is also attributed to the presence of effete materials in the blood. This condition may occur during convalescence from specific fevers such as influenza, etc., in which the kidneys are called upon to perform extra work.

Bacterial infection and infection by toxins are also credited with producing this condition.

Various forms of acute nephritis are described, but they are of far more interest from a pathological than from a clinical and therapeutical aspect. The symptoms presented will not enable us to make a differential diagnosis with reference to the pathological condition of the kidneys that is present.

The symptoms suggestive of acute nephritis in the horse are a stiffness in the hind-limbs, a straddling gait, and constant attempts at micturition; but only a small amount of urine is passed, which is concentrated and high-coloured.

In some cases there may be total suppression of urine, and on examination of the bladder *per rectum* it is found empty. Fever, colicky pains, and general constitutional disturbance are also present, and tenderness is evinced on pressure over the region of the kidneys.

The above symptoms should lead us to make a chemical and microscopical examination of the urine. If the case be one of nephritis, the urine will be found of high specific gravity, and will contain albumin, blood-corpuscles, and casts of the renal tubules, epithelial, hyaline, and blood casts. In very acute cases the urine may be of a smoky appearance, or blood-red in colour, and may contain blood. The percentage of urea in the sample of urine examined is high, but the excretion of urea from the system is diminished.

Suppression of urine is a very serious symptom, and when it continues a condition known as uræmia is induced. The animal usually assumes the recumbent posture, and is unable to rise. He struggles in a convulsive manner with fore and hind limbs, and makes constant attempts to force his head in a backward direction. Partial sweats may appear on the body, and in some cases a distinct uriniferous odour may be detected from the skin. Death usually occurs in violent convulsions.

In the treatment of acute nephritis an important point to bear in mind is that the kidneys, being in a state of inflammation, are unable to perform their function. Hence our

first aim in treatment should be to secure the elimination of effete and excrementitious materials by acting on the intestinal canal and the skin, and by this means to give the kidneys as much functional rest as possible.

To fulfil these indications a purgative should be administered consisting of aloes and calomel. The difficulty of inducing diaphoresis in the horse interferes with this method of elimination; nevertheless, it should be attempted by clothing the animal warmly, and administering repeated doses of the liquor ammonii acetatis. The luminous heat bath has proved very useful for this purpose (see p. 765).

Local measures of treatment are also of importance. Rugs thoroughly wrung out of hot water should be applied to the region of the loins, care being taken to avoid any danger of a chill resulting from the process. A mild application of mustard paste to the same region is recommended by some authorities.

The advisability of prescribing diuretics in acute nephritis is a point that requires consideration. It is quite clear that all diuretics of a stimulating nature—*i.e.*, those which act on the secreting cells of the kidney—are contra-indicated. Mild diuretics, however, which induce a flow of water through the kidneys, act beneficially by flushing out the renal tubules. Hence a liberal amount of drinking-water should be allowed, in which are dissolved small doses of sodium bicarbonate.

Of course, during the time that the purgative is acting care should be taken to allow only warm fluids. When the urine is very scanty in amount, or when suppression is threatened or is present, the question of administering diuretics is an important one, as we have to adopt every means to prevent the occurrence of uræmia.

In the early stage—*viz.*, that of engorgement of the organs—diuretics which act by raising arterial tension, such as digitalis, are contra-indicated. When this stage has passed the judicious administration of digitalis gives good results, especially when arterial tension is low and the action of the heart is feeble.

The infusion of the drug is preferable to the tincture, as it

is less liable to produce irritation, and the acetate of potash may be added with advantage.

In suppression of urine, the late Professor Williams advised the application of digitalis to the skin over the region of the loins either as a poultice, or in the form of a decoction repeatedly applied as a fomentation. When the kidneys commence to act the application should be discontinued ('Principles and Practice of Veterinary Medicine').

The pain which accompanies acute nephritis will require attention for its relief. Opium has been advised for this purpose, but as this agent interferes with the excretory action of the intestines and kidneys, it should be avoided. The most suitable agent for the relief of pain is chloral hydrate.

Attention to diet is of importance. Light food should be ordered, also linseed-tea, barley-water, etc. If the animal will drink milk it will prove of great advantage, and the more fluids taken the better. During convalescence tonics are indicated, such as quinine and iron, and salines, such as the sulphate of magnesia, may be given in the drinking-water in order to keep the bowels regular.

When suppression of urine continues in spite of treatment, and uræmia supervenes, a fatal result may be anticipated. In some instances professional aid is not sought until the animal is unable to rise, and is suffering from uræmic convulsions. Beyond administering a strong purgative and full doses of chloral hydrate, little more can be done in the way of treatment.

The hypodermic injection of pilocarpine has been suggested, but as this agent produces salivation in the horse instead of diaphoresis, we fail to see how it can be of any benefit.

In the dog acute nephritis is rarely met with. Exposure to cold, irritating diuretics, and injuries over the region of the kidneys are some of the causes that are likely to produce this affection.

The symptoms observed will vary according to the severity of the attack. The following may be observed, viz.: stiff-

ness in progression, also in lying down and rising; disinclination for movement; vomiting; loss of appetite; the urine scanty, high-coloured, and in severe cases tinged with blood or of a smoky appearance; frequent attempts at micturition; and tenderness on pressure over the region of the kidneys.

The presence of these symptoms should lead us to examine the urine, in order to confirm the diagnosis. If suppression of urine occurs and continues, symptoms of uræmia will appear, consisting of convulsions followed by coma.

The treatment is to be conducted on similar lines to those advised for the horse. A purgative dose of castor-oil should be administered; the animal should be kept warm; hot applications over the region of the kidneys are indicated, and fluids containing citrate of potash or bicarbonate of soda must be freely allowed.

The best diet is milk, if the animal can be persuaded to take a sufficient quantity of it. Otherwise beef-tea, mutton-broth, etc., may be allowed.

After the primary stage has passed, and if the urine is scanty, diuretics such as infusion of digitalis with acetate of potash should be prescribed. As digitalis frequently disagrees with the dog, citrate of caffeine combined with sodium benzoate may be substituted for it, from 3 to 10 grains of each, either given hypodermically or by the mouth. This combination often acts as an efficient diuretic. Diuretin, a combination of theobromine with salicylate of soda, may be given in doses of from 5 to 15 grains frequently repeated in solution. When vomiting is troublesome it should be checked with bismuth and hydrocyanic acid, or 5-grain doses of chloretone may be given by placing the powder on the back of the tongue.

If uræmia supervenes an active purgative is necessary, and a dose of compound powder of elaterin may be given, such as from $\frac{1}{2}$ to 2 grains, placed on the back of the tongue. The judicious employment of the hot bath, care being taken to prevent chill occurring afterwards, is often of benefit.

The Treatment of Chronic Nephritis, or Chronic Bright's Disease.

Fortunately chronic nephritis is not of common occurrence in animals, as the termination is always fatal; and if a definite diagnosis of the existence of such a condition be made, treatment so far as the horse is concerned will seldom repay the trouble and expense involved.

Chronic parenchymatous nephritis, depending on the pathological condition known as the *large white kidney*, may follow an attack of acute nephritis, or the symptoms may come on slowly and without any apparent cause.

The usual symptoms observed are dropsical swellings of the limbs and other parts of the body; intermittent attacks of pain of a dull character; scanty secretion of urine, which contains albumin, tube-casts, red blood-corpuscles, leucocytes, renal epithelium, etc. Other symptoms are loss of appetite, progressive debility, anæmia, and evidences of gastric catarrh.

In some cases the commencement of the affection may be insidious, and an examination of the urine reveals its true nature. In others, after a series of attacks of what would appear to be mild forms of nephritis, acute symptoms occur, and pain, general dropsy, and marked alterations in the character of the urine, are quickly followed by uræmia and death. We have observed temporary improvement to occur and the animal to remain apparently free from renal trouble for an indefinite period; but eventually a final attack comes on without any apparent cause.

The other form of chronic nephritis, known as *interstitial*, and depending on the pathological condition termed the small red contracted or cirrhotic kidney, is also met with in the horse.

In this form the disease may be in existence for a considerable time before a renal affection is suspected. Loss of condition, a capricious appetite, disturbed digestion, and other evidences of ill-health, may be observed; the urine is increased in quantity, and in the early stages the albumin

present therein may be small in amount. The presence of tube-casts is not constant, and the occurrence of general dropsy is rare.

Cardio-vascular changes are common, consisting of continuous high arterial tension, hypertrophy of the left ventricle of the heart, and general arterio-sclerosis. In this disease serious structural and functional affections of other organs are very likely to occur.

Treatment in both varieties of chronic nephritis can only be palliative, and is to be carried out on similar lines to that advised for the acute form of the disease. But, as already remarked, if we have obtained distinct evidence from a careful chemical and microscopical examination of the urine that the horse is suffering from either form of the disease, it would be unwise to advise treatment except by the desire of the owner.

Here we may urge the necessity and importance of examining the urine in every case of an obscure nature. By carrying out this simple procedure we are enabled to detect the existence of a renal affection, even in the absence of symptoms suggestive of such a condition. On the other hand, we avoid making an erroneous diagnosis, and ascribing symptoms such as a stiff and straddling gait and an alteration in the appearance of the urine to the presence of nephritis, when they depend on some other affection.

Some authorities state that chronic nephritis occurs more frequently in the dog than in the horse. This is certainly not our experience, but it is very probable that a number of such cases are not diagnosed, as the symptoms are often very obscure.

In the dog the following phenomena may be present, viz.: stiffness in progression and on turning round, emaciation, alterations in the appearance and amount of the urine, frequent micturition, and the occurrence of dropsy and gastric derangements. These symptoms should lead us to examine the urine, and thus to detect the existence of renal disease.

In the interstitial form of nephritis in the dog we have

observed excessive thirst, profuse urination, stiffness in progression, emaciation, occasional arching of the back, coldness of the extremities, general debility, and a capricious appetite. The disease may be in existence for some time without any marked symptoms being presented, and in the early stages no albumin may be present in the urine. Inter-current affections of other organs are not unusual in cases of interstitial nephritis. This affection also occurs as a complication of canine typhus (see p. 704).

The treatment will resemble that advised for acute nephritis. The important point is to secure elimination of toxic materials from the blood by insuring a free action of the bowels. Attention to diet is of importance. Milk and light forms of diet are indicated, so as to avoid any irritation of the kidneys, such as would result from the ingestion of highly nitrogenous foods.

No hard-and-fast rules can be laid down in the way of treatment; the symptoms or conditions that arise during the progress of the case must receive appropriate attention. There is no medicinal agent which will directly check the loss of albumin in the urine. If dropsy be present, diuretics such as digitalis or caffeine may be prescribed. In some cases the iodide of potassium gives temporary benefit. If ascites be extensive, tapping will be indicated.

The animal should be protected from cold and chills. The bowels should be kept regular by repeated doses of non-irritating aperients. If salines are borne by the stomach, doses of sulphate of magnesia will prove of service. If these induce vomiting, a mixture containing a reliable preparation of cascara sagrada with syrup of buckthorn may be given at intervals. Mercurials should be avoided, as, in consequence of the processes of elimination being interfered with, these agents may be retained in the system, and produce injurious effects.

Iodide of potassium is indicated in interstitial nephritis, as it tends to lessen excessive arterial tension, which is an important pathological condition in this affection. If cardiac dilatation and anæmia supervene in the more advanced stages, digitalis with iron should be given.

It is clear that treatment can only be palliative; but in the case of favourite animals we are usually expected to prolong life if possible, provided that constant distress is not present.

In the therapeutics of renal affections in the dog, the impossibility of acting on the skin with drugs, so as to assist elimination by diaphoresis, must be borne in mind. The hot-air bath or the luminous heat bath will prove useful in assisting elimination.

Many other kidney affections are described in text-books, but as their diagnosis is a matter of extreme difficulty, and as from their rarity they are only of pathological interest, their treatment does not merit consideration here. These include renal calculi, nephritic abscesses, and other pathological conditions of the kidneys; for information thereon the student is referred to Professor Law's standard work on 'Veterinary Medicine.'

The Treatment of Certain Morbid States of the Urine.

Albuminuria.—The presence of albumin in the urine does not always indicate the existence of a renal affection. It may be present in a great variety of diseases, such as pneumonia, anæmia, infectious lung diseases, red-water, etc. It may also occur after violent exertion, and from absorption of cantharidin as the result of too extensive blistering with cantharides.

When occurring independently of renal affections, the treatment will vary according to the disease with which it is associated. Of course, a careful microscopical examination of the urine will be necessary in order to decide the presence or absence of a renal disorder.

TEST FOR ALBUMIN.—Acidulate the urine by adding acetic acid, then boil. If the precipitate does not dissolve on addition of nitric acid, it is albumin.

Hæmaturia.—The presence of blood in the urine may depend on a variety of circumstances. Thus it may occur in renal calculus, mechanical injuries to the kidney or urinary

tracts, congestive or inflammatory conditions of the kidney, bladder, or urethra, or urethral calculi.

When the blood is intimately mixed with the urine, the seat of the hæmorrhage is usually the pelvis of the kidney.

The presence of blood-casts of the uriniferous tubules points to the existence of acute nephritis. A dark-brownish colour of the urine may depend on the conversion of hæmoglobin into acid hæmatin, and the source of the hæmorrhage is probably renal.

When the hæmorrhage is from the bladder, the blood is only passed at the termination of micturition, and the blood-clots are of a flat appearance when formed from the floor of this viscus.

When from the urethra, pure blood is passed at the commencement of micturition, and in the case of urethral calculi it may also appear at the termination of the act.

The treatment will depend on the *source* of the hæmorrhage. When arising from the bladder, if a vesical calculus be the cause, surgical interference will be necessary.

In other cases, the injection of astringent solutions into the bladder, such as a solution of alum (2 grains to the ounce of water) or of hazeline (1 part to 2 parts of water), is indicated. Enemata of cold water are sometimes useful.

If depending on the presence of urethral calculi, surgical interference will be required.

When arising from acute renal congestion or acute nephritis, hot applications to the loins are indicated.

The hypodermic injection of ergotin has been found of value in cases of hæmaturia, while lately the use of adrenalin solutions has given good results (see p. 390).

Pyuria.—The presence of pus in the urine is detected by a microscopical examination of the latter. Pus cells may be found in small numbers in urine that appears normal. When in large amount, they may indicate the presence of suppurative inflammation of the pelvis of the kidney, termed ‘suppurative pyelitis.’ This may depend on the presence of a renal calculus, or the bladder may become affected by the extension of the inflammatory process along the ureter.

Suppurative cystitis may also cause suppurative pyelitis by extension upwards. A catarrhal form of pyelitis is recognised by some authorities.

Urethritis may also cause the presence of pus in the urine.

The treatment of pyuria will depend on its causes.

When depending on cystitis, special treatment will be necessary (see p. 528).

If depending on the presence of a renal calculus (which may be suspected if there are recurrent attacks of abdominal pain, with the appearance of pus in the urine), but little can be done by way of treatment. It has been suggested to operate and remove the calculus, but such a procedure has not yet advanced beyond the theoretical stage.

If the pus depends on a condition of catarrhal pyelitis, which tends to become chronic, the administration of balsamic stimulants may prove of benefit. Balsam of Peru or Tolu may be given, or small doses of oil of turpentine may be tried.

Phosphaturia.—Excess of phosphates in the urine is a condition found in the ox and sheep when fed extensively on turnips and linseed-cake. It is said that turnips or other roots grown upon land that has been highly manured with dissolved bones, etc., are specially likely to produce this condition. These phosphates may cause phosphatic deposits on the mucous membrane of the bladder, urethra, and on the long hairs surrounding the preputial opening of the ox and sheep. On the latter region they may form tubes composed of ammonio-magnesian phosphate.

In the sheep, calculi composed of the latter agent are those usually found.

In the horse, sediments in the bladder, and calculi are usually formed of carbonate of lime.

The treatment of phosphaturia consists in changing the diet, and in administering small doses of dilute nitric acid three times daily.

Excess of Carbonate of Lime.—In the horse and ox, excess of carbonate of lime may become deposited in the bladder, either as a sediment, causing an accumulation of

sabulous matter, or as a calculus. In such cases surgical treatment will be required.

To prevent the occurrence of these conditions, animals showing the presence of much sediment in the urine should be treated with small doses of dilute hydrochloric acid. These tend to dissolve the earthy carbonates and render them soluble in the urine.

Oxaluria.—This is a condition characterised by the presence of an abnormal amount of crystals of oxalate of lime in the urine. The exact source of oxalates is not known, and different theories are suggested. Some authorities believe that they result from imperfect oxidation of nitrogenous elements. Whatever be their source, the symptoms presented in the horse are by no means unfamiliar. The appetite is capricious, the skin dry and scurfy in appearance, the animal is 'hide-bound' and loses condition. Micturition is frequent, and the urine is of a pale amber colour. In severe cases there is stiffness in the region of the loins, and uneasiness shown during micturition. Symptoms of acid dyspepsia are present, the animal licking the walls, and in some cases eating clay. Irregular feeding and long fasts are said to cause this condition, also food rich in saccharine matter, such as carrots and turnips. The urine is either acid or neutral in reaction, and contains the octahedral form of crystals of oxalate of lime, the 'dumb-bell' form being very seldom met with.

Microscopic examination of the urine will show the presence of the characteristic crystals. In some cases the oxalic acid is present in a free state, and the oxalate of lime may not be detected in the urine until it has been left standing for some time. The crystals of oxalate of lime are soluble in nitric acid, insoluble in water, and unaltered by boiling with acetic acid or liquor potassæ.

The treatment of this condition consists in first administering an aperient. As debility is usually present, the safest agent for this purpose is magnesium sulphate, which may be given both in the food and drinking-water until the bowels are sufficiently acted on.

Dilute nitro-muriatic acid appears to give the best results in cases of oxaluria, and should be given in combination with tincture of nux vomica and tincture of gentian three times a day after feeding. If there be much irritability of the bladder present, evidenced by uneasiness, whisking of the tail, and frequent micturition, tincture of hyoscyamus is indicated. When the nitro-muriatic acid does not appear to succeed, the acid phosphate of soda may be substituted. This was recommended by the late Professor Williams.

Attention to diet is necessary; the food should be light and easily digested. Linseed-tea and barley-water are indicated when vesical irritability is a prominent symptom. Plenty of fluids should be allowed, and a judicious amount of exercise ordered. Care should be taken that the drinking-water does not contain an excess of lime.

FORMULÆ.

Diuretic Mixture for the Early Stages of Acute Nephritis in the Horse.

R	Sodii bicarb.	...	...	̄ii.ss.
	Potassii citrat.	...	...	̄ii.ss.
	Sodii benzoatis	...	...	̄x.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

Diuretic Mixture in Secondary Stages of Acute Nephritis in the Horse.

R	Infusi digitalis	...	...	̄xv.
	Potassii acet.	...	...	̄v.
	Potassii iod.	...	...	̄v.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

Mixture for Suppression of Urine in Chronic Nephritis in the Horse.

R	Tinct. digitalis	...	...	̄x.
	Potassii acet.	...	...	̄ii.
	Liq. ammonii acet. conc.	...	...	̄x.
	Spts. æth. nit.	...	...	̄v.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

Sedative Mixture for Uræmic Convulsions in the Horse.

℞ Chloral hyd. ...	...	...	℥ii.ss.
Potassii bromidi ...	...	...	℥v.
Mucilaginis ...	...	...	℥iv.
Aquæ ...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls in a pint of linseed-gruel every three hours, as required.

Saline Diuretic Mixture for Acute Nephritis in the Dog.

℞ Potassii acet. ...	...	...	℥ss.
Potassii bicarb. ...	...	...	℥ii.
Liq. ammonii acet. ...	...	...	℥iii.
Syr. aurantii ...	...	...	℥ii.
Aquæ ...	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three or four times daily.

Hypodermic Injection in Cases of Suppression of Urine in the Dog (Secondary Stages of Acute Nephritis).

℞ Caffeinæ cit. ...	...	...	grs. iii. to grs. x.
Sodii benzoatis ...	...	...	grs. iii. to grs. x.
Aquæ ...	...	...	℥x. to ℥xx.

Sig.: Give at once. Repeat every four hours as required.

Another Diuretic Mixture for Nephritis in the Dog.

℞ Caffeinæ cit. ...	...	...	grs. xl.
Potassii acet. ...	...	...	℥vi.
Potassii iod. ...	...	...	℥i.
Syr. aurantii ...	...	...	℥ii.
Aquæ ...	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every four or six hours as required.

Hæmatinic Diuretic Mixture when Case is improving.

℞ Ferri et ammonii cit. ...	...	...	℥i.
Potassii citratis ...	...	...	℥iii.
Tinct. scillæ ...	...	...	℥i.
Spts. æth. nit. ...	...	...	℥vi.
Syr. aurantii ...	...	...	℥ii.
Aquæ ...	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times daily.

Cardio-vascular Diuretic in Cases of Chronic Nephritis in the Dog.

℞	Tinct. digitalis	...	...	℥ii.
	Potassii iod.	...	...	℥i.
	Potassii acet.	...	...	℥ss.
	Syr. aurantii	...	...	℥ii.
	Aquæ	...	...	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times daily.

Mixture for Oxaluria in the Horse.

℞	Acidi nitro-hydrochlor. dil.	...	...	℥ii.ss.
	Tinct. nucis vom.	...	...	℥x.
	Quininæ sulph.	...	...	℥ii.ss.
	Tinct. gent. co.	...	...	℥v.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls two or three times daily in a pint of linseed-gruel.

Mixture for Hæmaturia in the Horse.

℞	Ac. gallici	...	...	℥x.
	Ac. sulph. dil.	...	...	℥v.
	Mucilaginis	...	...	℥iv.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours in a pint of linseed-tea.

Mixture for Hamaturia in the Dog.

℞	Ol. terebinth.	...	...	℥i.
	Ac. sulph. dil.	...	...	℥i.
	Ac. gallici	...	...	℥ss.
	Mucilaginis	...	...	℥ss.
	Aquæ	...	...	℥i.

F. m. Sig.: Give from half a teaspoonful to two teaspoonfuls every three hours.

CHAPTER XI

THE TREATMENT OF CYSTITIS, DIABETES, AZOTURIA, AND RED-WATER

The Treatment of Cystitis.

Cystitis, or inflammation of the bladder, is seldom met with in veterinary practice. It may arise from the absorption of cantharidin when extensive areas of skin are blistered with cantharides, also from large doses of irritating diuretics.

Retention of urine and over-distension of the bladder may produce cystitis, also microbic infection extending downwards from the kidney in cases of pyelitis. Cystitis may give rise to ammoniacal fermentation of the urine, which tends to further increase the vesical irritability that is present, and may dissolve the epithelial cells, causing extensive desquamation. The usual symptoms in the horse are: uneasiness, in some cases amounting to actual pain; the frequent passage of urine in small amounts, accompanied by straining; a stiff, straddling gait is present; the urine may contain pus, and is usually alkaline and ammoniacal. In some cases, however, it is acid in reaction.

The treatment consists in adopting measures to reduce the inflammatory condition of the bladder, and to prevent decomposition of the urine therein. If the urine tends to undergo ammoniacal decomposition, the administration of boric acid in doses of 2 to 4 drachms three times a day is indicated; it tends to render the urine acid and acts as a urinary antiseptic. With this should be combined either belladonna or hyoscyamus, which act as sedatives to the bladder.

Other agents recommended are benzoic acid and salol. Should the urine be acid in reaction, alkalies are indicated, such as potassium bicarbonate or sodium bicarbonate.

Linseed-tea and barley-water should be allowed freely, and in order to regulate the bowels, either magnesium sulphate or sodium sulphate may be given in the food.

In severe cases it is necessary to wash out the bladder with solutions of borax or boric acid. This can be accomplished by means of a double-channelled catheter.

In the dog, cystitis is treated on similar lines.

In this animal we meet with cases of irritation of the bladder probably depending on excessive acidity of the urine. Micturition is frequently attempted, and only small amounts of urine are passed at a time. A mixture containing bicarbonate of potash, tincture of hyoscyamus, and infusion of buchu is indicated, and in many instances produces satisfactory results in a short time.

Here we may draw attention to the importance of a careful examination of the bladder in the dog when abdominal distension is present. The latter may depend on a paralysed condition of the bladder and distension of the organ with urine, although no symptoms may be present which would lead us to such a conclusion.

In doubtful cases it is always a safe practice to pass the catheter, and thus avoid the possibility of a serious error in diagnosis.

The Treatment of Diabetes Mellitus, or Glycosuria.

Diabetes mellitus is a disease of rare occurrence in the horse. In the cases recorded, the course of the affection was slow and insidious, and treatment was only palliative.

The presence of sugar in the urine may depend on disturbances of the glycogenic functions of the liver, the result being that sugar is added to the blood in greater amounts than it can be utilised in the processes of nutrition; hence it appears in the urine.

Another form of the disease is believed to depend on some disturbances in the nutritive changes in the blood and tissues,

the result being that the sugar is not used up in the system, and is eliminated in the urine. This form is very fatal, as even the restriction of carbohydrates does not lessen the glycosuria to any marked extent.

In the cases of this disease that have been recorded the symptoms presented were: emaciation, intense thirst, an abnormal appetite, debility, the urine largely increased in amount, of high specific gravity, and of a pale colour.

Some observers have recorded the presence of a subnormal temperature, and of cataract and ulceration of the cornea. The late Professor Robertson described a case of this disease in which nervous symptoms were present, consisting of a want of control over the movements of the hind-limbs and drowsiness; evidences of syncope on elevating the animal's head were also observed ('Equine Medicine').

The presence of emaciation, debility, abnormal appetite, thirst, and excessive urination should lead us to examine the urine for the presence of sugar. One of the simplest tests for sugar is known as *Trommer's*, and it is based on the principle that in alkaline solutions sugar reduces a metallic oxide to a suboxide. It is carried out as follows:

To a little urine in a test-tube add an equal amount of liquor potassæ and a few drops of a weak solution of cupric sulphate. If sugar be present, a bluish precipitate of hydrated cupric oxide will appear, which redissolves on shaking, a clear blue liquid resulting. If sugar be absent, the mixture will be of a green tint. Next boil the mixture. If sugar be present a yellow and finally a red precipitate of cuprous oxide is produced.

The *fermentation* test may also be employed as follows:

Add a few crumbs of German yeast to a test-tube full of the suspected urine; insert over a saucer, and bring into a warm atmosphere. If sugar be present there will be an evolution of CO_2 .

Various methods of treatment have been suggested for glycosuria, but in the horse it is almost impossible to eliminate carbohydrates from the dietary, and this constitutes the most important therapeutical measure. As

previously remarked, the affection is a progressive one in spite of any form of treatment.

Skim-milk and buttermilk have been suggested as a suitable diet, but this is certainly not practical so far as the horse is concerned. Codeine in daily doses of 12 grains is said to have given good results. Sodium salicylate has also been recommended.

Temporary glycosuria has been observed in the horse in pulmonary disorders and in azoturia; hence discretion is necessary and frequent examinations of the urine desirable before giving a definite diagnosis.

In the dog glycosuria is more frequently met with.

According to some authorities, lesions of the liver are present in the majority of cases. The disease may also be associated with interstitial nephritis. It is usually met with in aged pampered dogs.

The symptoms are: emaciation, marked thirst, abnormal appetite, frequent urination; in some case ulcers may form on the cornea. Nervous symptoms may appear, such as hemiplegia and coma. Skin affections, such as eczema, may be present. Other organs may simultaneously become diseased. Inflammation of the gums and dental caries have also been observed.

In some cases a mild form of the disease is met with, which progresses slowly, while in others emaciation proceeds with great rapidity.

In the treatment of this affection a large number of drugs have been tried, but the disease tends to a fatal termination in spite of all therapeutical measures.

Opium or codeine appears to exert a favourable influence in some cases; the manner in which they act in this direction is not known. Codeine may be given in doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain three times daily. This agent is less constipating in its action than morphine or opium, and is not so liable to disturb digestion.

Mr. Henry Gray, M.R.C.V.S., Kensington, advises the following combination in the treatment of this affection:

R Pulv. opii	...	...	gr. ¼.
Cretæ præp.	...	...	grs. iii.
Pulv. ipecac.	...	...	gr. ss.
Ferri carb.	...	...	gr. i.

F. pil i. Mitte xii. Sig. : Give one to four pills two or three times a day.

The above prevents the intense craving for food and water that occurs in this disease. Water should be allowed *ad lib*.

Attention to diet is of first importance in treatment. All starchy foods and sugars must be interdicted. Milk, lean meat, raw or cooked, and fats should be allowed. The bowels should be regulated by occasional doses of magnesium sulphate or sodium sulphate, which may be given in the food; if these are refused by the animal, the extract of cascara may be given in tablet form.

When inflammation of the gums is present, an alkaline antiseptic mouth-wash should be used, such as one containing 1 drachm of borax, ½ drachm of boric acid, and ½ drachm of potassium chlorate, in ½ pint of camphor water.

Among the drugs which have been tried in the treatment of glycosuria we may mention bromide of arsenic, bromide of soda, salicylate of soda, salol, antipyrin, etc.

The Treatment of Diabetes Insipidus.

Diabetes insipidus, or polyuria, is an affection of comparatively frequent occurrence in the horse. The leading symptoms consist of great thirst, the passage of large quantities of pale-coloured urine of low specific gravity, rapid emaciation, loss of appetite, and incapacity for work. It is essentially a disease depending on food of inferior or bad quality, such as musty oats or hay, mow-burnt hay, kiln-dried oats, etc. In some horses hay containing an undue amount of clover will induce the affection, and occasionally a number of horses in the same stable may be simultaneously affected. The cause on inquiry will usually be found to depend on a supply of food of inferior quality.

In the treatment of this disease the first essential is to inquire into the quality of the food, and if this is found to be at fault, it must be immediately changed.

Of medicinal agents, iodine or its preparations give the most successful results in this affection. Either pure iodine may be given in the form of bolus twice daily, or potassium iodide may be combined with iron and administered in the food.

Lugol's solution—consisting of iodine, 20 grains; potassium iodide, 30 grains; and water, 1 ounce—is readily taken in the drinking-water by some horses.

The effect of iodine is to diminish thirst and restore normal assimilation. Water should not be restricted, and if there are evidences of acidity of the stomach, such as licking the walls, etc., sodium bicarbonate should be added to the drinking-water.

The bowels should be regulated by administering sulphate of magnesia in the food.

Daily exercise must be ordered, but on no account should the animal be worked until all symptoms have disappeared.

The Treatment of Azoturia or Hæmoglobinuria.

This disease is one of comparatively frequent occurrence in equine practice. Its pathology is not as yet understood, hence its treatment in severe cases is unsatisfactory.

We are aware of the following facts with reference to the causation of the affection: A period of idleness is necessary, during which the horse has been fed on highly nitrogenous food. No symptoms are observed until the animal is put to work or exercise, when at a short distance from the stable he becomes stiff in the hind-quarters, crouches and makes attempts to lie down, sweats profusely, the gluteal muscles become hard and swollen, and the urine assumes a porter-coloured or coffee-coloured appearance. Colicky pains are manifested in some cases.

If the animal is immediately rested and put into a stable the attack may gradually pass off; but if the affection be of a severe type, or if the animal be forced to continue exercise or work, he becomes incapable of standing, and soon assumes the recumbent position, and struggles with fore and hind limbs in a convulsive manner.

The muscular spasms come on at intervals, and in the mare the urine is usually ejected with much force, depending on spasmodic contractions of the bladder. The convulsions increase in intensity, and the animal dies of exhaustion. The urine contains albumin and methæmoglobin, and to the latter substance its dark colour is due. In some cases the urine may be of a dark-red colour.

Nervous sequelæ may follow an acute attack of azoturia. The animal may be unable to bear any weight on the hindlimbs, and the extensor muscles of these regions become atrophied, and occasionally those of a fore extremity become similarly affected.

Various theories have been advanced to explain the occurrence of this affection. The late Professor Williams taught that it depended on a hyper-nitrogenous condition of the blood and system generally, due to overfeeding and insufficient exercise. Professor J. Law regards it as a 'toxæmia from imperfect hepatic function.'

As we are here concerned with the therapeutical aspect of the disease, we cannot enter into a discussion on a subject which is as yet far from being settled. The symptoms of the affection would lead us to infer that some toxin must be at work on the system, but of its origin we are ignorant.

All authorities agree that in the treatment of this affection it is of first importance to cause elimination of morbid material from the system by the action of a carthartic. For this purpose aloes combined with calomel should be given at once. Many cases when treated early in this manner recover.

In very mild attacks of the disease spontaneous recovery often takes place by simply keeping the animal at rest and clothing him warmly on the first appearance of the symptoms.

The secretion of urine is seldom interfered with in the first stages of the affection, but it is often necessary to employ the catheter in order to relieve the bladder, which may become overdistended.

We see no objection to the administration of diuretics in

this disease, and are of opinion that they assist elimination of effete products. Moderate doses of sweet spirit of nitre combined with tincture of colchicum are indicated for this purpose.

The skin should be warmly clothed in order to assist cutaneous elimination.

A good bed of short straw or chaff in a large loose-box is advisable, and the animal, if unable to rise, should be turned from side to side every four hours. If on the third or fourth day he is unable to rise without assistance, it is necessary to employ the slings, and great care is required in their use.

The animal should be watched by the attendant until the limbs regain some of their lost power. After a few days the slings may be removed for a short time and a little exercise given, with caution; but when permitted to lie down for the first time careful watching is necessary, as the animal may not be able to rise with facility, and may injure himself in his attempts to do so.

But many cases are of a very severe type from the commencement, and convulsions occur in spite of treatment. To allay these the only agent of any value is chloral hydrate; however, its effect is but temporary, and it has to be repeated.

Again, cases are met with in which, although struggling is absent, there is total inability to bear any weight on the hind-limbs, and the animals sink in the slings when placed therein; hence this mode of treatment cannot be employed.

Permanent inability to bear any weight on the hind-limbs, the animal 'knuckling over' at the fetlocks and being unable to extend the limbs, is one of the unfortunate sequelæ of this disease. The hypodermic injection of strychnine may be tried, but in our experience such cases are hopeless. Atrophy of the extensor muscles ensues, and sloughing of the skin occurs in various parts of the body from pressure caused by the constant recumbent position of the animal.

The value of external applications to the region of the loins in cases of azoturia is doubted by some authorities. In our experience the application of rugs wrung out of hot

water and diligently and carefully used exert a favourable influence and increase the secretion of urine.

The symptoms met with in the later stages of cases of azoturia that tend to a fatal termination resemble those of uræmia, and, indeed, cannot be distinguished from those of the latter affection. In some cases the urine gives evidences of the existence of nephritis, and the kidneys on post-mortem examination may present the lesions of this affection.

Attention to diet is of importance in the treatment of azoturia, and for the first few days it should be light, easily digested, and restricted. Plenty of fluids should be allowed, and moderate doses of magnesium sulphate should be given in the drinking-water after the effect of the purgative medicine has passed off.

Some authorities advise bleeding in the early stages of azoturia when the patients are plethoric.

The disease is very apt to recur in some horses, hence preventive measures are necessary. These consist in securing plenty of exercise and limiting the supply of nitrogenous food when the animals are not at regular work.

The influence of cold weather as a factor in the causation of the disease is doubted by some authorities. Although admitting that more cases occur in cold than in warm weather, we must not overlook the fact that during long spells of frost horses are more apt to be left idle in the stables, especially hunters. In our experience more cases occur in mares than in horses, but this may be a coincidence.

The hypodermic injection of 4 to 8 fluid drachms of a 1 in 10,000 solution of adrenalin chloride has been found useful in the treatment of azoturia by Zehl, of Trebbin, Germany. He terms the disease *lumbago gravis*, and states that one injection as above is sufficient to produce favourable results, the patients being able to assume the standing posture in a short period of time.

The Treatment of Hæmoglobinuria or Red-water in Cattle.

Two forms of this disease are recognised, viz.:

(a) *Parturient*, occurring in dairy cows about eight or fifteen days after calving.

(b) *Non-parturient*, occurring in dry stock and in dairy cows.

Recent investigations have demonstrated that in the latter form the actual cause in many instances is the presence of parasites belonging to the Protozoa in the blood, and the species is termed the *Piroplasma bovis*.

The effect of these parasites on the blood is to render it thin and watery, to diminish the number of red corpuscles and to liberate the hæmoglobin. The disease is believed to be spread by ticks, which are the bearers of the contagium from animal to animal.

The cause of the parturient form is not yet definitely settled. According to some authorities it is a dietetic affection. Animals fed largely on turnips, especially if the latter have been grown on poor, badly-drained land, are subject to it.

The late Professor Williams regarded red water as being due to insufficient feeding, and stated that it 'originates in an impoverished condition of the blood, arising from want of proper food; that the albumin of the blood is thus degraded in quality, and as such is unfit to be appropriated for the nourishment of the tissues, and is consequently excreted by the kidneys and expelled from the body' ('Principles and Practice of Veterinary Medicine').

Impoverished pastures and coarse, innutritious grass are well known to be factors in the production of this disease, especially if the animals have been newly brought under these conditions. The pulse in this affection is peculiar, having a thrilling or double beat, and marked cardiac palpitation is present.

Diarrhœa is frequently one of the first symptoms noticed; this is followed by obstinate constipation, depending on a paralysed condition of the gastro-intestinal canal.

The passage of red-coloured or porter-coloured urine is usually the symptom on which the diagnosis is based. The urine contains albumin, and the coloration is due to the presence of hæmoglobin.

A varying degree of fever is present, also marked prostration, and evidences of general anæmia.

If all cases of red-water depended on piroplasmosis, we should expect the administration of quinine to give good results, but many practitioners have found it useless. Others, however, claim that this agent exerts a favourable influence on the disease. A Continental authority, Van Hellens, recommends large doses—viz., 5 drachms of quinine in one dose, to be repeated for the following two, three, or four days.

We have seen the best results from full doses of raw linseed-oil, repeated until the bowels act freely. This is followed up with stimulants and nerve tonics. We administer from 1 to 2 ounces of ammonium carbonate, 2 drachms of powdered nux vomica, 1 ounce of sodium bicarbonate, 1 ounce each of powdered gentian and aniseed, in 1 pound of treacle and 2 pints of strong ale, three times daily. We find that such treatment restores tone to the alimentary canal and overcomes the constipation that is present, the ammonium carbonate also acting as a valuable stimulant.

Sulphate of magnesia is not only useless in this affection, but absolutely harmful, and many cases are rendered hopeless by the owners administering large amounts of this agent.

If the case is seen at the early stage, some practitioners advise from 8 to 10 ounces of sodium chloride to be given in a quart of milk. The diarrhœa which is so common a symptom at the commencement of the disease is on no account to be checked by astringents; but instead it is advisable to administer a dose of raw linseed-oil.

The practitioner does not often get the case to treat in the early stages; it is usually when obstinate constipation, entire loss of appetite, and weakness are present that his services are requisitioned.

The late Professor Williams advised albuminous foods, such as milk and eggs, and also the administration of potassium chlorate, in order to improve the quality of the blood.

Entire loss of appetite is one of the most serious symptoms in connection with red-water. The practice of drenching with large quantities of gruel, etc., with the idea of keeping up the animal's strength, is greatly to be condemned. The appetite should be tempted with small quantities of food of various kinds. The stimulants and nerve tonics we have already mentioned will usually cause the appetite to return. The addition of 1 or 2 ounces of mustard sometimes acts as a useful gastric tonic and stimulant in such cases.

When large quantities of Epsom salt, Glauber's salt, or common salt have been administered by the owners, serious depression results, and we often have the complication of gastritis induced thereby.

When appetite and rumination are returning, and the bowels commence to act normally, we find that tonics such as the carbonate of iron combined with nux vomica and gentian are useful.

Preventive treatment is of importance in connection with this disease. Attention to diet, a proper supply of nutritious food, and avoidance of coarse, ill-drained pastures are details that should not be overlooked. If one case of the disease occurs in a herd of cattle, the remainder should be carefully watched, so as to detect the earliest symptoms of the affection. We find it is a good practice to administer full doses of raw linseed-oil to the healthy as well as to the affected animals.

Rock-salt should be placed on the pasture, about 10 cwt. to the acre.

If ticks are found on the animals, parasiticide dressings should be employed: a combination of sublimed sulphur 12 ounces, carbonate of potash 6 ounces, oil of tar 6 ounces, and rape-oil 1 gallon, has been found effectual for this purpose.

FORMULÆ.

Mixture for Cystitis in the Horse.

R Ac. borici ʒx.
 Tinct. hyoscyami ʒiii.
 Aquæ... .. ad O.i.

F. m. Sig. : Give two wineglassfuls three times a day in a pint of linseed-tea.

Mixture for Cystitis in the Dog.

R Ac. benzoici grs. lxxxv.
 Syr. aurantii... .. ʒv.
 Aquæ destil... .. ad ʒx.

F. m. Sig. : Give from two teaspoonfuls to a table-spoonful every three hours.

Injection for Washing out the Bladder in Chronic Cystitis.

R Ac. borici ʒss.
 Glycerini ʒi.
 Aquæ ad. ʒv.

M. F. lotio. Sig. : Mix with an equal quantity of warm water and inject.

Mixture for Irritability of the Bladder, with Excessive Acidity of the Urine, in the Dog.

R Potassii bicarb. ʒii.
 Tinct. buchu ʒi.ss.
 Tinct. hyoscyami ʒiii.
 Aquæ ad ʒvi.

F. m. Sig. : Give from two teaspoonfuls to a table-spoonful three times a day.

Powders for Diabetes Insipidus in the Horse.

R Ferri sulph. exsicc. ʒi.ss.
 Potass iod. ʒi.ss.
 Pulv. anisi ʒiv.

M. Div. in pulv. xii. Sig. : Give one twice a day in the food.

Mixture for Diabetes Insipidus in the Horse.

R Iodi ʒii.
 Potass. iod. ʒv.
 Syr. aurantii ʒiv.
 Aquæ ad O.i.

F. m. Sig. : Give two wineglassfuls twice daily in a pint of linseed-tea.

Diuretic Mixture for Azoturia in the Horse.

R	Tinct. colchici	...	...	℥ii.ss.
	Spts. aeth. nit.	...	...	℥viii.
	Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls three times a day
in a pint of linseed-tea.

Sedative Mixture for Convulsions occurring in Azoturia.

R	Chloral hyd.	...	...	℥v.
	Potass. bromid.	...	...	℥v.
	Mucilaginis	...	...	℥iv.
	Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours
as required, in a pint of linseed-gruel.

Nerve Tonic and Stimulant Drench for Red-water in Cattle.

R	Ammonii carb.	...	...	℥ii.
	Pulv. nucis vom.	...	...	℥ii.
	Sodii bicarb.	...	...	℥i.
	Pulv. gentian.	...	...	℥i.
	Pulv. anisi	...	...	℥i.

M. Sig. : To be given in 1 pound of treacle and
2 pints of strong ale, and repeated three times daily.

CHAPTER XII

THE TREATMENT OF DISEASES OF THE NERVOUS SYSTEM

SECTION I.

THE TREATMENT OF CEREBRAL AFFECTIONS.

MANY nervous affections, so far as the horse is concerned, are of more interest from a pathological than a therapeutical point of view.

In the first place, unless an animal can be rendered useful for work the expense of treatment is seldom desirable, and many of these affections being progressive and incurable, the efforts of the therapist are not likely to prove of any practical benefit.

In the next place, the diagnosis of such affections is attended with considerable difficulty, and even if we were enabled to differentiate the various diseases, the favourable influences which we can exert on them by therapeutical measures are very limited.

It is our intention to consider only those affections in which treatment is likely to prove of benefit, omitting chronic cerebral diseases and such cases as abscesses and tumours in the brain, etc.

Symptoms attributable to cerebral disorder are met with in certain gastric affections, and great difficulty is often experienced in distinguishing which organ is the primary seat of disease.

The classification of cerebral affections by veterinary authorities is by no means definitely arranged, and this is

not surprising, because in practice similar symptoms may be present in cases of uncomplicated brain disease and in those arising from gastric disorder. Thus, in the affection known as 'stomach staggers' the staggering gait and sleepy appearance of the head may mask the symptoms of the gastric affection, and, under suitable treatment, the nervous symptoms may disappear when the stomach is restored to a normal condition. But this favourable termination does not always occur, and cases of gastritis complicated with meningitis are by no means uncommon.

In the primary stages it is impossible to determine the ultimate result of nervous symptoms, such as a staggering gait and other phenomena attributable to cerebral disorder. These may depend on sympathetic cerebral disturbance due to gastric impaction, or they may be the premonitory symptoms of a serious affection, such as inflammation of the brain and its meninges.

In order to facilitate our consideration of the therapeutics of cerebral disorders, we shall classify them as follows :

- (a) Vertigo or megrims.
- (b) Epilepsy.
- (c) Cerebral affections depending on gastric disorders.
- (d) Acute inflammation of the brain and meninges, known as encephalitis, phrenitis, etc.

The Treatment of Vertigo or Meggrims.

Vertigo, or giddiness, may be a symptom of many cerebral affections, and also of cardiac disease. The term 'abdominal vertigo' is sometimes applied to this condition when it occurs in connection with gastric disorder; but the affection to which we now wish to direct attention is a peculiar one, obscure in its origin and seriously interfering with the utility of the horse.

Harness horses are more commonly the subjects of this disease, usually those in high condition, well fed, and irregularly worked; but we also observe it in posting horses, and occasionally in saddle horses.

It is by no means so frequently met with in the present

day as in former times; probably the reason for this is to be found in a more rational system of dietetics and hygiene.

The usual history of the case is that the horse leaves the stable apparently fresh and in perfect health. After going a variable distance, usually a short one, he slackens his pace, and shakes his head in a peculiar manner, turning it sideways and appearing as if a foreign body was present in his ear. The muscles of the head and neck appear stiff, and the action of the hind-limbs seems weak. If pulled up immediately the symptoms may pass off, and the animal may be able to resume his journey in a short time; but if the animal be driven on he staggers and trembles all over, and may fall before he can be unharnessed.

In some cases before going down he appears stiff and rigid in his muscles, sweats, and may move in a circular manner or run against a wall or fence and get beyond control. When down he struggles violently, but after a short period he rises, and all symptoms may disappear.

The peculiarities of this affection are its sudden appearance, the violence of the symptoms, and the quick recovery.

The late Professor Robertson regarded it as depending on a badly-fitting collar, which by pressing on the jugular veins produced mechanical hyperæmia of the brain. This may be the cause in some cases, as when attention is paid to the collar or a breast-strap is used instead, the attacks may not recur; but a large number of cases are met with in which the collar fits perfectly, and we have also seen cases in saddle horses.

Gastric indigestion has been suggested as a cause, and attention to the hours of feeding and the administration of an occasional purgative have proved successful in some instances as preventives.

Other causes suggested are the presence of parasites in the ear and diseased conditions of the internal ear. Optic vertigo is also recognised by some authorities, and the prevalence of the affection during bright sunny weather is ascribed to reflex causes; the influence of coming out of a dark stable into sunlight being considered sufficient to excite

the nerve centres. The presence of cardiac disease may, of course, be a cause of vertigo. We must admit, however, that the causes in the majority of cases of this affection are obscure.

Treatment in cases depending on a badly-fitting collar will, of course, be directed to remedy this defect.

Most horses that have had one severe attack change hands, as few horse-owners care to run the risk of driving them again. For this reason it is seldom that we have an opportunity of watching the progress of these cases, or observing the effect of treatment thereon.

During the attack the animal should be taken out of harness as soon as possible and removed to a field or to the nearest stable. As it is impossible to keep him on his feet, he should be protected from injuries when struggling, and also sheltered from sunlight. The duration of the attack being short, the animal should be returned to his stable and a purgative administered.

Attention to diet is of importance ; large feeds should be avoided, and a proper interval allowed after feeding before the horse is put to work.

In cases of obscure origin nothing further can be done, but it becomes an important question when we are asked whether the horse is likely to be safe for driving again. In the case of a family horse the risk is far too great, but in other instances it is quite possible that after attention to diet and physic the attacks may not recur. But, personally speaking, we should not care to run the risk of driving an animal that had been the subject of a severe attack, as once experienced, it is not likely to be forgotten. The violence of the symptoms and the uncontrollable condition of the animal during the attack might give rise to serious consequences in a crowded thoroughfare.

No doubt, in many cases a recognition of the premonitory symptoms and promptly getting the horse out of harness may avert an attack, but in others the animal may fall down without much preliminary warning.

Epilepsy.

Epilepsy has many features in common with the affection just described. It may occur either in the stable or while the animal is at work. Authorities state that in epilepsy spasmodic contraction of the muscles and loss of consciousness are present, while these are absent in vertigo.

In the animal affected by epilepsy the attack comes on suddenly; the limbs become rigid, and he falls heavily. When down, convulsive movements of the limbs, grinding of the teeth, champing of the jaws, distorted eyeballs, stertorous breathing, and tumultuous action of the heart, occur.

The pathology of the disease is obscure. In many instances no lesions are discovered in the nervous system on post-mortem examination. In others various lesions of the nervous system have been found in cases that presented epileptiform convulsions.

Intestinal irritation by parasites is said to be a cause of epileptic seizures by some authorities. True epilepsy is an affection of rare occurrence in the horse, but, of course, what are known as epileptiform convulsions may occur in various forms of cerebral disease.

In true epilepsy very little can be done in the way of treatment, as the attacks are liable to recur at irregular intervals. Purgatives and attention to diet may lessen the frequency of the attacks, but it is quite clear that the animal is not safe for use. The usual history of such cases is that they frequently change hands.

In the dog epilepsy is far more frequently met with than in the horse. It is not to be concluded, however, that every case showing symptoms of convulsions is one of true epilepsy (see p. 548).

In true epilepsy no definite cause can be ascertained for the attacks, and they are apt to recur at irregular intervals in spite of treatment. The attack may occur when the animal is at rest or at exercise. It is preceded by a sharp cry; the animal falls, may attempt to rise again, but soon becomes

unconscious. Tonic spasms of the muscles are present, succeeded by those of the clonic type. There are frequent movements of the jaws, and abundant discharge of saliva; the tongue may be injured by being caught between the teeth. Respiration is irregular and incomplete while the convulsions last, and may be stertorous in character. The visible mucous membranes become livid. The attack in most cases only lasts a few minutes, and the dog recovers spontaneously. Occasionally recovery is more prolonged.

The treatment of true epilepsy is seldom satisfactory. Various tonics and nerve sedatives have been tried and recommended, but it cannot be said that any special agent is beneficial. During the attack the animal should be prevented from injuring himself, and perfect quietude should be ordered. No attempts at administering medicines should be made until the seizure is past.

An active cathartic is indicated, and attention to diet is necessary. The food should be light, so as to avoid distension of the stomach.

In some cases the bromides of potassium or sodium prove useful in preventing attacks. The triple bromides sometimes act better than potassium bromide alone. Thus, 2 parts of potassium bromide and sodium bromide, with 1 part of ammonium bromide, may be given three times daily. Large amounts are required in some cases, so it is advisable to gradually increase the doses.

Bromide of arsenic in doses of $\frac{1}{100}$ to $\frac{1}{12}$ grain is advised by some authorities. Zinc oxide has occasionally been found useful, in doses of 2 to 5 grains twice daily.

Eclampsia, or Convulsions, in the Dog.

Convulsions consist of involuntary muscular contractions. They occur in a variety of conditions, and hence must be regarded as symptoms. Those occurring in epilepsy depend on some obscure disorder of the brain, the pathology of which is at present unknown.

Functional convulsions may occur as the result of peri-

pheral nervous irritation, such as the process of dentition in young dogs; also from the presence of parasites in the alimentary canal, in the ear, or in the nasal sinuses.

General convulsions are also present in cases of meningitis.

To distinguish the convulsions of epilepsy from those due to reflex irritation is by no means an easy matter. If depending on the process of dentition or on parasites, treatment of these conditions will usually cause the symptoms to disappear. Convulsions may also appear in cases of canine distemper, in which the central nervous system is implicated. Foreign bodies in the alimentary canal may also give rise to convulsions.

A peculiar form of eclampsia is occasionally met with in bitches when nursing a large litter of puppies. It is more frequently seen in highly-bred animals, and is believed to depend on anæmia. The convulsions in such cases are very severe, but tend to cease spontaneously.

The treatment of this latter affection consists in sustaining the animal's strength, and, if possible, in weaning some of the puppies. If the fits recur it will be necessary to prescribe bromides.

The rational treatment of convulsions is to inquire into their cause.

If depending on dentition, the gums should be lanced and the mouth examined for the presence of retained milk teeth; the latter should be extracted. If parasites are the cause appropriate remedies for their removal should be prescribed.

A mild purgative, such as castor-oil, is indicated in all cases, so as to clear out the alimentary canal.

In the convulsions occurring in connection with the nervous form of canine distemper a combination of potassium bromide and chloral hydrate sometimes proves useful, but such cases are very often fatal. If cardiac weakness be present chloral hydrate should not be given.

It is very difficult to ascertain the origin of convulsions or fits in many cases, especially at our first examination of the patient. Some cases appear dull and sleepy after the termination of a fit or series of fits, the eyes closed, and the gait

staggering. In such instances a guarded prognosis should be given.

The hot bath judiciously employed proves useful in some cases of convulsions. Care should be taken, however, not to cause exhaustion, and the animal should be thoroughly dried and clothed afterwards, so as to avoid any danger of a chill resulting.

Phrenitis, Encephalitis, Mad Staggers, Stomach Staggers, Meningitis, in the Horse.

Under this heading a variety of acute cerebral affections are included. To attempt a differential diagnosis between inflammation of the brain and meningitis is to draw theoretical distinctions which cannot be recognised in clinical medicine. It is very probable that in the majority of cases, when meningitis is present, the cerebral structures also become involved, and *vice versa*.

Among the many causes which may give rise to acute inflammation of the brain and its membranes, we may mention traumatic or mechanical injuries of the cranial region, also the effect of ingestion of certain food, such as rye-grass when it has commenced to ripen, or when, after being cut, it is allowed to heat and ferment before being used. The actual effect of rye-grass in this condition is not known. Some authorities consider that it contains a narcotic principle.

Fodder affected with cryptograms or bacterial ferments is also regarded as a cause of encephalitis. Violent exertion and fatigue are also recognised as causes, and we have seen the affection arise in hunters at the termination of a very hard day's work, also in harness horses that have been overdriven. But we meet with cases in which the cause is obscure, and these might with propriety be termed idiopathic. Meningitis is sometimes met with as a complication of some of the specific fevers, such as influenza.

We have met with many cases of meningitis in which post-mortem examinations revealed the lesions of gastritis as well as those of the affection mentioned.

Very little is definitely known with reference to the causation of these cases, and we seldom get the opportunity of observing them in the early stages.

Impaction of the stomach is usually accompanied by cerebral symptoms; but these, as a rule, are limited to a staggering gait, a sleepy appearance of the head, and a tendency to force the latter against the manger or wall. In some cases, however, distinct symptoms of meningitis supervene in the more advanced stages.

Some authors recognise as a distinct affection 'grass staggers, or enzootic paraplegia,' and believe that it occurs as the result of ingestion of rye-grass in a condition already mentioned (see p. 549). It is said to affect the spinal cord to a greater extent than the brain, although it is admitted that the latter organ may become involved towards the later stages.

The clinical phenomena observed in cases of inflammation of the brain and its membranes are not always definite or distinct.

In some instances the primary symptoms are a staggering gait, a sleepy condition, a tendency to force the head against walls and surrounding objects. These are succeeded by a stage of excitement. The animal walks round his box in a state of delirium, knocks his head against surrounding objects; the sight is impaired, and the membrana nictitans may be protruded in a convulsive manner, as observed in tetanus, the head at the same time being 'poked out.' He may rear up against the sides of the stall and fall down, then struggle in a violent manner and rise again, and move quickly around his box.

There may be brief periods of quietude, but without any warning violent symptoms occur. Ultimately he falls down, and is unable to rise, and fits of violent convulsions commence, rendering it dangerous for anyone to approach him. The head is usually forced in a backward direction, and the eyes move from side to side in a quick, convulsive manner.

After a variable number of convulsive attacks a comatose condition and general paralysis result, and death follows from exhaustion and coma.

In other cases the animal goes down early, paralysis of the hind-limbs ensues, and convulsions occur without preliminary symptoms. In some instances we have observed a very high temperature, the thermometer registering 107° F. or 108° F. Stertorous breathing and profuse sweating may also be present.

The post-mortem appearances are often very insignificant in comparison with the violence and intensity of the symptoms. In some cases the meninges are swollen and congested, and the vessels of the pia mater are injected and tortuous. Effusion of reddish-coloured serum is present, and the substance of the membranes is thickened by exudate. The ventricles contain a serous effusion. When the spinal cord is involved as well as the brain, congestion and effusion are present in the membranes, and the cord itself may be softened and of a reddish colour. In other instances, no lesions can be discovered at the autopsy.

The treatment of this condition is unsatisfactory. In our experience, when the animal is unable to maintain the standing posture, and when convulsions occur, the case terminates fatally in spite of treatment.

As it is necessary to attempt treatment, the first essential in this direction is to administer a large dose of an active cathartic: 6 drachms of aloes and 2 drachms of calomel may be given, as it is difficult to obtain the action of a purgative in this affection. Croton-oil is advised by some practitioners. Perfect quietness of the surroundings is important. In plethoric subjects, if attended early, bleeding should be resorted to, and from 4 to 6 quarts of blood may be abstracted from the jugular.

Bleeding is, however, useless, if not harmful, when exudation has taken place from the cerebral and meningeal blood-vessels. Chief reliance must be placed on the purgative, which not only acts as an eliminant, but also as an effectual derivative from the brain. If the purgative fails to act, some authorities advise the hypodermic injection of physostigmine.

To combat the convulsions, full doses of chloral hydrate combined with potassium bromide should be given. Cold

water or ice should be applied to the head in a diligent manner, and precautions should be taken to prevent the animal injuring himself during his struggles.

Opiates of all kinds should be avoided, as they tend to increase the cerebral congestion, produce excitement, and interfere with elimination.

Attention to the bladder is necessary, and usually the catheter has to be employed. This is by no means an easy matter, in consequence of the struggling of the animal. Beyond administering full doses of chloral hydrate, and repeating them until a sedative effect is produced, little more can be done in the way of treatment.

We believe that cases characterised by violent convulsions are hopeless, and so consider that the most humane treatment is to order their destruction if no improvement is apparent after a reasonable time. In milder cases, if the physis acts and the convulsions can be kept under control, hopes of recovery may be entertained. The acute symptoms may pass off, and defective motor-power may remain. In such cases a blister should be applied to the region of the poll, and a stimulating liniment rubbed along the spine. Potassium iodide, given internally, is indicated, and sometimes gives good results.

The normal action of the bowels must be maintained by giving sulphate of magnesia in the food or drinking-water, and the diet should be light.

In cases where great prostration, stupor, and coma are present, but little can be done in the way of special treatment. As these symptoms depend on the presence of exudation and compression, stimulants are of no value.

In certain cases, however, after the acute symptoms have subsided and marked prostration appears, stimulants, such as ammonium carbonate, may be prescribed with benefit.

In ordinary cases of what are known as 'stomach staggers' the cerebral symptoms may disappear after the gastric affection on which they depend has been relieved (see p. 429). Many of these cases may be presumed to depend on a mild form of cerebral congestion, as they readily yield to treat-

ment, the most important detail of which is the prompt administration of an active cathartic. It must be distinctly understood, however, that many cases of gastric impaction present no evidences of cerebral complications.

We must admit that in a case presenting symptoms of inflammation of the brain and its membranes it is almost impossible to state whether it has arisen as a disease *per se* or secondary to a gastric affection. Similar symptoms are also present in the secondary stages of azoturia and in uræmia, so that the presence of convulsions and inability to rise cannot be regarded as by any means diagnostic.

As previously remarked, the influence which the therapist is enabled to exert on such conditions is very limited, and the fine points of distinction which are found in some text-books with reference to the various inflammatory conditions of the brain and its membranes cannot be recognised clinically.

The Treatment of Meningitis and Encephalitis in the Dog.

In this animal, as in the horse, a differential diagnosis of these conditions is not possible. The symptoms may in some cases appear gradually, but usually they come on suddenly.

Very often the first indication is a fit of convulsions, followed by a series of fits at irregular intervals. The conjunctivæ become deeply congested, twitching of the head and cervical muscles may occur, the eyes roll, and the pupils are dilated.

In some cases great restlessness and irritability are present, and there is a tendency to bite on being handled. Many of such cases have been mistaken for rabies, and great discrimination in diagnosis is necessary.

In other cases, after a succession of fits of convulsions, a stage of stupor sets in, and paralysis appears, the animal dying in a comatose condition.

Treatment is seldom successful. An active cathartic is

indicated, and full doses of bromides should be given in order to act as sedatives to the nervous system.

When convulsions are frequent, chloral hydrate may be added to the bromides. The animal should be placed in perfectly quiet surroundings.

In cases occurring as a sequel to distemper, the hydrobromide of quinine and phenacetin have occasionally been found useful; 1 to 3 grains of each may be given every three hours. Belladonna is advised by some practitioners to overcome the convulsions; we have found chloral hydrate far more effectual. The latter may be given in the form of enema when it is difficult to administer medicines by the mouth.

Should we be so fortunate as to tide the patient over the acute stage, the iodide of potassium should be prescribed in 3 to 5 grain doses four times daily, in order to promote absorption of effusion.

A subacute or chronic form of meningitis, obscure in its origin and insidious in its development, is met with in the dog. The symptoms at first are slight. They consist of an occasional stagger when moving, a vacant expression of the eyes, the head carried slightly sideways, a slight want of control over the movements when running, a tendency to fall over objects in his path, inability to locate sounds, and if called he goes in the opposite direction. As the disease advances he staggers and falls without any cause, and cannot walk or run in a straight course. We have also observed an abnormal appetite, and a desire to fill the stomach with grass, etc.

An active purgative may give relief to the symptoms in the early stages. This is, however, temporary, as convulsions succeeded by paralysis are the ultimate result.

Injuries to the head have been suggested as causes of this affection, but as many cases have occurred in the absence of such injuries, we must confess ignorance as to its etiology.

Various forms of treatment have been tried, such as counter-irritation to the back of the head, the administra-

tion of potassium iodide and strychnine, but without any permanent benefit.

Judging by the fatal results that occur in the majority of cases of meningitis and allied disorders, it becomes a question for the practitioner as to the advisability of treating such cases when acute symptoms develop. Instead of letting such cases linger on and suffer pain, it is more humane to advise destruction.

In human medicine, meningitis is regarded as very fatal. In Osler's 'Practice of Medicine' the affection is described as 'a disease recognised as almost invariably fatal, and in which the cases of recovery are extremely doubtful.' Similar remarks would apply to the disease in all animals in veterinary practice.

The Treatment of Chorea.

Chorea is a peculiar nervous disease characterised by constant twitching of certain muscles or groups of muscles. It is rare in the horse, and is said to affect the head, neck, and fore-limb. The late Professor Robertson describes a case which occurred during a severe attack of influenza, and in which well-marked symptoms of chorea in both anterior and posterior extremities were present, and continued till death.

Some authorities regard shivering and string-halt as forms of chorea, but the similarity of the affections is not at all obvious. Chorea is an affection frequently met with in the dog, and usually occurs as a sequel to distemper. Its pathology is obscure, and treatment is unsatisfactory. The muscles of the head may be affected, or those of one or both fore-limbs or of a hind-limb. In severe cases treatment usually fails. In milder cases, if taken in hand early, improvement may be brought about, but seldom a complete recovery.

Many drugs have been tried in the treatment of chorea, but the superiority of one agent over the other has not been practically demonstrated. Strychnine is certainly contra-indicated during the continuance of the choreic symptoms

in the early stages, as it increases the nervous excitement and irritability that are present. When these symptoms become less severe this drug may prove of value as a nervine tonic.

Arsenic has been tried in a large number of cases, and in our experience it gives the best results. The drug should be given at first in small doses in the form of Fowler's solution, and gradually increased as tolerance is established. If the physiological actions of the agent become manifest, it should be discontinued for a few days.

When in severe cases treatment has to be attempted by desire of the owner, nerve sedatives are indicated. Of these either the bromide of potassium or sodium is best. Belladonna is recommended by some practitioners for this purpose. Amongst other agents which have been tried in the treatment of chorea we may mention the sulphate, oxide, or valerianate of zinc, the bromide of arsenic, and chloral hydrate.

Attention to the digestive organs and to diet is necessary during treatment. Before commencing treatment in a case of this affection, the owner of the dog should be informed of the unsatisfactory termination that is probable.

SECTION II.

THE TREATMENT OF DISEASES OF THE SPINAL CORD.

From a therapeutical point of view this subject does not present many features of interest, hence our remarks thereon will be brief. There are spinal affections of a chronic nature, such as string-halt and shivering, in which treatment cannot exert any effect; but animals suffering from these diseases are useful for certain kinds of work. If a spinal affection is of such a nature that the horse is rendered unfit to perform work of any kind—and our experience teaches us that treatment cannot alter this state of affairs—then destruction of the animal should be advised.

Again, as inability to assume the standing posture is a very frequent symptom of spinal affections, we have to

consider the effects that are likely to ensue in a case that for a long period is unable to rise. These are the formation of sloughing sores on the parts of the body exposed to pressure (commonly known as 'bed-sores'), wasting of the muscles, debility, and complications such as nephritis.

Great discrimination is necessary in giving a prognosis with reference to a case presenting the symptoms of inability to rise, and in deciding whether treatment or destruction is advisable. A very careful examination of the patient should be made, and the history of the case should be ascertained as far as possible. Hasty conclusions must be avoided. It is far better to keep the case on hand for a short period, so as to verify a diagnosis, than to order destruction and find that the lesion was not a hopeless one, by the animal recovering in other hands. Paralysis of the hind-limbs being a symptom of various diseases and conditions, it is necessary to ascertain its cause before advising treatment. Thus, it is present not only in cases of fracture of the vertebræ, injuries and acute inflammatory conditions of the spinal cord, and in the secondary stages of acute cerebral affections, but also occurs in azoturia and nephritis. Again, in strain of the psoæ muscles and in certain pelvic fractures inability to assume the standing posture may be present.

Space will not permit us to consider the differential diagnosis of these conditions, and the student is referred to text-books on veterinary medicine and surgery for information on the subject. It is important to remember that sensation may be present in the hind-limbs (evidenced by the animal moving them when the skin of the region is pricked with a pin), and also the power of motion indicated by struggling: but, still, the animal may not be able to bear any weight on these limbs, and consequently assumes the recumbent position. In severe injuries to the spinal cord, such as from fracture of a vertebra causing compression, both sensation and motor-power are lost in the hind-limbs, this constituting true paraplegia.

In true spinal affections brain symptoms are absent, such as delirium, coma, and loss of consciousness; but in acute

spinal meningitis it is often difficult to differentiate the cerebral form from the spinal. In many instances, however, acute spinal meningitis appears to spread to the cerebral structures, and we have the symptoms of both affections combined.

We shall only draw attention to those spinal affections in which there is some probability of treatment being followed by a return to utility. The others, and unfortunately the majority, are of pathological interest only. We must admit, however, that the therapeutical measures which are at our disposal in the treatment of such diseases are extremely limited.

Acute Myelitis—Acute Inflammation of the Spinal Cord— Acute Spinal Meningitis.

It is difficult, if not impossible clinically, to differentiate acute myelitis or inflammation of the substance of the spinal cord from acute spinal meningitis. In the former affection it is said that the symptoms appear in a more insidious manner, and that there is an absence of rigidity and spasms of the muscles of the neck, back, and limbs, phenomena that are characteristic of spinal meningitis. In many cases the two affections are combined, while in others, obscure in their nature and causation, and variable as regards their termination, we cannot discover the exact pathological condition that is present.

The causes of acute inflammation of the spine are usually stated to be direct violence and exposure to cold after fatigue or overwork.

We have seen one typical case of spinal meningitis in a horse that, after being recently docked, was sent a long journey by boat in very bad weather. The animal was exposed to cold and not properly clothed. The symptoms developed on the day after arrival at his destination. Whether the recent docking had any influence or not is a matter of opinion, but the primary symptoms observed were a staggering gait, a partial loss of control over the movements of the hind-limbs, marked hyperæsthesia over

the gluteal region ; if lightly handled rigidity of the muscles would ensue. While standing there were constant movements of the hind-limbs, first one limb and then the other being raised from the ground in a quick, convulsive manner. Marked constitutional symptoms were present, consisting of a temperature registering 105.5° , accelerated respirations, a quick, wiry pulse, and profuse sweating. The spinal affection spread rapidly forward, and spasms of the muscles appeared, together with evidences of cerebral excitement. The animal lay down and struggled in a convulsive manner, became completely paralysed in the hind-limbs, and was destroyed as incurable.

In some cases the disease develops slowly, and paralysis occurs without any violent symptoms being manifested. Here we may direct the attention of the student to the similarity of some of the symptoms in acute spinal meningitis and in acute laminitis affecting the hind-feet. The quick, constant movements of the hind-limbs, the animal elevating one foot from the ground, then the other, in a nervous manner, and the stiffness in movement, are symptoms common to both affections, and errors in diagnosis have often occurred in this direction.

The Treatment of Obscure Forms of Spinal Affections.

Some cases of this nature are obscure in their origin, or it may be that we are unable to obtain a correct history from the attendant. On attending, we find the animal suffering from loss of control over the hind extremities. He is unable to walk beyond a few steps, and staggers if forced to move ; or if turned round quickly he falls down, and is unable to rise without assistance.

We have met with a case in which this loss of control over the hind-limbs and inability to rise without assistance lasted for a long period. The horse was unable to stand for any length of time. The spinal affection appeared to spread to the anterior portion of the spinal cord, and to leave the posterior portion, as after some time he was able to raise himself on the hind-limbs, while unable to bear any

weight on the fore extremities. After a lengthened period of treatment with potassium iodide and nux vomica he made a perfect recovery.

A very common cause of spinal affections in the horse is falling into a deep dyke when on grass or when hunting. The struggles of the animal in his efforts to extricate himself, especially if the space be narrow, may cause serious injury to the spine, in addition to the effects of the fall itself. In such cases, after being brought out, there may be evidences of a serious spinal injury, such as complete paralysis of the hind-limbs, and a fracture of one of the lumbar vertebræ may or may not be present. Or there may be temporary inability to use the hind-limbs, and after suitable treatment recovery may ensue.

In other cases the horse may be able to stand with assistance or to walk with great difficulty, the gait staggering, with partial loss of control over the hind extremities. In such instances our opinion should be guarded, as we must admit that under careful treatment recoveries may take place, although very slow and tedious. Not infrequently slight evidences of spinal disease may be permanent after the acute stage has disappeared, such as a difficulty in turning round or in backing, but not sufficient to interfere with the utility of the animal for slow work.

While paraplegia under all circumstances must be regarded as a very serious symptom in the horse, as previously remarked, we must avoid a hasty diagnosis and prognosis.

Under the heading of 'Spinal Concussion,' the late Professor Robertson described a condition characterised by stiffness of the loins, and a want of control over the movements of the hind-limbs, so that on leaving the stable the animal may knock the projections of the haunch against the sides of the doorway.

Walking is performed moderately well, but if the animal is forced to a quicker pace or is made to turn or to back, the want of control over the hind-limbs becomes apparent. In some instances there is difficulty in rising.

This affection is observed in hunters, and results from

leaping when the drop was considerable ; or it may occur from a fall, as when the animal is at grass and slips while running. These cases usually recover with simple treatment, such as rest, the administration of a purgative, the application of rugs wrung from hot water to the lumbar region, followed by a stimulating liniment. In some instances recovery is rapid, in others it takes a longer period, and the administration of *nux vomica* combined with potassium iodide becomes necessary.

Enzootic Paraplegia, or Grass Staggers, is recognised by some authorities as resulting from feeding horses on rye-grass at a particular period of its growth (see p. 550). It is also termed reflex or sympathetic paraplegia, and the alterations in the spinal cord are said not to be well marked. In some instances softening of the cord and injection of the meninges with a slight degree of exudation were present. In other cases no lesions were detected.

We have now to consider the treatment that is indicated in the spinal affections to which we have briefly drawn attention.

In cases of acute spinal inflammation, a full dose of purgative medicine should be given, consisting of aloes and calomel. These agents are believed to produce a favourable influence by acting as derivatives, thus reducing the congested vessels of the spinal cord and its membranes.

Rugs wrung out of hot water should be diligently applied to the spine. Some practitioners find the application of a fresh sheep-skin more convenient and efficacious. Such applications are believed to relieve spasm and pain, and to reduce congestion of the spinal cord. As a rule placing the animal in slings cannot be carried out, as he sinks down in them, and is apt to struggle. A good bed and frequently turning the animal, and otherwise attending to his comfort, is safer treatment when the standing posture becomes impossible.

Attention should be paid to the state of the bladder, as distension of this organ is apt to occur ; hence the use of the catheter is usually needed. If the purgative fails to act

—and this is often the case, in consequence of the derangement of nervous function—it will be necessary to repeat the physic, and for this purpose we prefer calomel, of which a full dose may be given.

The hypodermic injection of eserine is advised by some authorities as a quick and effectual purgative in these cases, but the nervous excitement it induces is greatly against its value. The action of the purgative may be assisted by enemata and the administration of magnesium sulphate in the drinking-water.

On theoretical grounds the employment of belladonna and ergot has been advised, as they are believed to cause constriction of the spinal vessels, and thus lessen hyperæmia of the spinal cord. We have never observed any benefit from their use.

When spasms of the muscles and violent struggling occur, chloral hydrate in full doses should be administered. Such cases are almost invariably fatal, as either exhaustion or complete paralysis results. If after a reasonable time elapses no improvement is apparent, the most humane course is to have the animal destroyed.

If we are so fortunate as to have the acute symptoms subside, and observe a general improvement in the animal, although he is still unable to bear weight on the hind-limbs, the hypodermic injection of strychnine in doses of 1 grain three times daily should be employed. The iodide of potassium should also be given in the food or drinking-water three times a day, in order to promote absorption of effusion from the cord and meninges.

Counter-irritation to the spine sometimes gives favourable results. The best method is to apply the thermo-cautery over a considerable length of the spine on both sides, either in the form of line or point firing. If properly carried out, there is no necessity for any blister being applied afterwards. If, in spite of these details, paralysis continues, the case is hopeless.

In those obscure forms of spinal affection to which we have drawn attention treatment should be conducted on

similar lines to the above. Purgatives, hot applications and stimulating liniments to the spine, and the administration of *nux vomica* with potassium iodide, constitute the means at our command to act favourably on these conditions.

In the acute stages of these affections *nux vomica* or strychnine is contra-indicated, as it is likely to increase the existing irritation in the spinal cord and induce spinal hyperæmia.

In all cases where the animal is unable to rise a soft bed is absolutely essential, and he should be frequently turned from side to side, so as to avoid the occurrence of localised sloughing of the skin from pressure by lying thereon. In order to prevent this, a lotion composed of tannin and rectified spirit (10 grains of the former dissolved in each ounce of the latter) may be frequently applied to those parts of the body which are likely to suffer from pressure. This has the effect of hardening the skin.

Paraplegia and Chronic Ossifying Spinal Pachymeningitis in the Dog.

Independent of paraplegia resulting from injuries to the spine, and acute myelitis and spinal meningitis, we recognise in the dog a peculiar form of spinal disease, the nature of which was not understood until recently.

In aged fat dogs a sudden attack of paralysis of both hind-limbs, without any apparent cause, is frequently met with in canine practice. This was regarded as reflex paraplegia, depending on impaction of the intestine, as the latter condition accompanies the paralysis, and the administration of an active cathartic in some cases caused the paralysis to disappear if the attack was a primary one.

This view was accepted by many practitioners, although doubts were often entertained as to the manner in which an impacted intestine and obesity caused paralysis, as the two former conditions are very frequently met with without the presence of paraplegia.

Mr. Henry Gray, M.R.C.V.S., Kensington, who has devoted special attention to this subject, is of opinion that

such cases depend on a diseased condition of the spinal cord, which he designates chronic ossifying spinal pachymeningitis (the latter term signifying inflammation of the dura mater). According to this view, the constipation that is present is the effect, and not the cause, of the spinal affection. The majority of cases are liable to recurring attacks, and eventually become paralysed and incurable. But all attacks are not so sudden, and the disease may commence insidiously.

The animal is disinclined to move, and utters painful screams when handled. The gait is stiff and rigid, and difficulty is experienced by the animal in going up or coming down stairs or steps. In some cases any movement will cause intense pain.

A peculiar point is that, in many instances, if the animal be firmly manipulated no evidences of pain are observed.

In another form of the disease the neck appears to become affected, and paroxysms of pain appear, during which this region becomes swollen; or the abdominal muscles may become painful and rigid, and this may alternate with the cervical affection.

The affection may disappear for a time, but recurs usually during spring or autumn or on exposure of the animal to cold or damp. Paraplegia sooner or later appears, but some cases may with suitable treatment last for a long period.

This affection has been regarded as rheumatic in its nature by many authors, and has been termed chronic spinal rheumatism, lumbago, rheumatic spinal meningitis, rheumatic paralysis, recurrent paralysis, spinal neuralgia, etc. The similarity to rheumatic attacks is certainly marked; but as the result of autopsies on the subjects of this disease, Mr. Gray is of opinion that the symptoms depend on an affection of the dura mater, and that the spinal nerves become involved in the inflammatory process.

The post-mortem lesions as found by Mr. Gray are as follows:

‘The characteristic lesion is thickening of the dura mater in patches, which ultimately increases to such a size as to

press on the spinal cord and cause corresponding loss of function posterior to the lesion. During the active stage of the disease, especially if the spinal nerves are implicated, we have increased sensibility of the parts supplied by sensation from that portion of the cord in the vicinity of the lesion. If the exudate is of recent origin it becomes absorbed, and if the irritation is removed, we find that the pain ceases, and the pressure and the corresponding paralysis disappear. If the lesion causing the paralysis cannot be reduced so as to relieve pressure, the paralysis or paresis remains, to increase in degree every time the animal gets a fresh attack.

‘The thickening of the dura mater may be of the consistence of cheese or hard as stone. It is soft when recent, or fibrous when older, and is calcareous, bony, or stony when of long standing. It may resemble fibrous tissue, cartilage, bone, or ivory. The patches may be found anywhere on the dura mater of the spinal cord, but principally in the lumbar region, and not rarely in that of the cervical. They may even extend the whole length of the cord. They are usually elongated, and take the course of the cord; sometimes they are ovoid, circular, or irregular; usually they have a flattened appearance, occasionally prominent. Sometimes they coexist with disease of the intervertebral cartilages, and even of the vertebral bony canal. The ultimate effect of these enlargements is a narrowing of the spinal canal and pressure on the cord’ (*Veterinary Record*, July 16, 1904).

The treatment of this affection is of great importance, as in the case of favourite animals we must adopt every means to prolong life, even if we are unable to bring about perfect recovery.

The indications for treatment are to relieve the painful symptoms, to promote absorption of the recent exudate, and to restore nerve-power to the hind-limbs if paraplegia be present. It is quite clear that no form of treatment can restore the dura mater to its normal condition once the lesions in this membrane have become organised. A cathartic is indicated in all cases, so as to relieve the constipation that

is present and also to act as a derivative to the spinal vessels.

The patient should be kept warm and dry, and if paraplegia be present attention must be paid to the state of the bladder, and the catheter employed if necessary. Very often if the animal be helped on to his legs he will urinate of his own accord. Perfect cleanliness of the bed must be insisted on. The food should be light, non-stimulating, and laxative. Liniment of iodine should be applied along the course of the spine. The application of severe counter-irritants in any form is useless and unnecessary.

In the primary, active, or acute stages nux vomica or strychnine is contra-indicated, as nerve tonics or nerve stimulants at this period aggravate the affection.

When paraplegia occurs in the early stages, similar remarks apply. Mr. Henry Gray advises sodium salicylate as the most reliable agent in the early stages of this affection, and in our experience it is of marked value. Its analgesic effects are especially observed during the stages of hyperæsthesia and the acute paroxysms of pain. From 5 to 10 grains should be given three times a day. In large dogs we have given as much as 30 grains and found that smaller doses produced no effects.

After the acute stage has passed we have either marked weakness of the hind-limbs to deal with or actual paraplegia. To combat these conditions, a course of potassium iodide is indicated or a combination of quinine, strychnine, and arsenic may be prescribed.

Permanent paraplegia is not an uncommon result of the disease, and this resists every form of treatment.

In our hands the employment of the electric battery has often given good results in overcoming the paralysis, but in many cases it has failed.

Hasty opinions as to prognosis should be avoided. If the case does not improve in from six weeks to two months it may be pronounced incurable. The luminous heat bath has proved of value in some cases. Care should be taken that in the animal's attempts to move about, the anterior

aspects of the hind-limbs do not suffer from being dragged along the ground. It is usually necessary to protect them with wool and bandages.

We have frequently employed the hypodermic injection of strychnine as an auxiliary to electricity in this affection, and in many cases with good results.

In some instances, after the animal is able to move about again, wasting of the muscles of the loins and gluteal regions appears, as well as an unsteady gait in the hind-limbs.

A second severe attack of paralysis is usually hopeless, but in many cases the animals may last for years with occasional recurrent attacks of a milder nature in the spring or autumn, or if exposed to cold or chills.

In some cases of sudden paraplegia, accompanied by paralysis of the bladder and rectum, and terminating fatally in coma, the post-mortem examination reveals spinal hæmorrhage, in addition to the lesions in the dura mater.

FORMULÆ.

Sedative Mixture for Convulsions in the Dog.

R Chloral hyd.	...	...	...	̄i.
Potassii bromid.	...	...	...	̄ss.
Syr. aurantii	...	...	...	̄ii.
Aquæ	...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every three or four hours, as required.

Mixture containing the Mixed Bromides for Epilepsy in the Dog.

R Ammonii bromid.	...	...	} āā ȳii.ss.
Sodii bromid.	...	...
Potassii bromid.	...	...
Syr. aurantii	...	...	ȳii.
Aquæ	...	...	ad ȳviii.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every three or four hours, as required.

Sedative Mixture for Meningitis in the Horse.

R Chloral hyd.	...	...	...	̄v.
Potassii bromid.	...	...	...	̄v.
Mucilaginis	...	...	...	̄iv.
Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls in a pint of linseed-gruel every four hours, as required.

Mixture for Acute Meningitis in the Dog in the Early Stages.

R	Quininæ hydrobrom.	...	grs. xxx.
	Phenacetini	... ..	grs. xxx.
	Syr. aurantii	... ..	ʒii.
	Mucilaginis	... ..	q.s.
	Aquæ	... ..	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every four hours.

Sedative Mixture for Meningitis in the Dog.

R	Chloral hyd.	... ..	ʒss.
	Potassii bromid.	... ..	ʒi.
	Tinct. opii	... ..	ʒv.
	Aquæ	... ..	ad ʒviii.

F. m. Sig.: Give from half a teaspoonful to two teaspoonfuls every three or four hours, as required.

Tonic Pills for Chorea in the Dog.

R	Ferri redacti	... ..	gr. i. to grs. iii.
	Quininæ sulph.	... ..	grs. ii. to grs. iii.
	Ac. arseniosi	... ..	gr. $\frac{1}{50}$ to gr. $\frac{1}{30}$.
	Excipient.	... ..	q.s.

F. pil. i. Mitte xii. Sig.: Give one three times a day.

Mixture for the Early Stages of Ossifying Spinal Pachymeningitis in the Dog.

R	Sodii salicylatis	... ..	ʒii.
	Syr. aurantii	... ..	ʒii.
	Aquæ	... ..	ad ʒvi.

F. m. Give from two teaspoonfuls to a tablespoonful three times daily.

Pills for Chronic Ossifying Pachymeningitis in the Dog.

R	Sulphur. præcip.	... ..	grs. iii.ss.
	Guaiaci resinæ	... ..	gr. i. $\frac{1}{4}$.
	Potassii iod.	... ..	gr. ss.
	Potassii acet.	... ..	gr. ss.
	Potassii bicarb.	... ..	grs. ii.
	Excipient.	... ..	q.s.

F. pil. i. Mitte xii. Sig.: Give from one to three pills three times daily.

Or:

R	Colchicinæ	... ..	gr. $\frac{1}{250}$.
	Methyl salicylatis	... ..	℥ iii.

F. pil. i. Mitte xii. Sig.: Give one to three pills three times daily.

Or, during the secondary stages :

℞ Potassii iod.	...	...	...	grs. ii. to grs. v.
Strychninæ sulph.	...	...	...	gr. $\frac{1}{80}$ to gr. $\frac{1}{40}$.
Ac. arseniosi	...	...	...	gr. $\frac{1}{50}$ to gr. $\frac{1}{20}$.
Excipient.	...	...	...	q.s.

F. pil. i. Mitte xii. Sig. : Give one pill three times a day.

N.B.—The doses must be computed according to the size of the dog.

CHAPTER XIII

THE TREATMENT OF DISEASES OF THE ORGANS OF RESPIRATION

GENERAL REMARKS.

RESPIRATORY affections are of very frequent occurrence in veterinary practice; hence a consideration of their rational treatment is of great importance.

While admitting that the therapeutical influences which we are enabled to exert on these affections are limited so far as treatment by drugs is concerned, we are well aware that by attention to hygiene, dietetics, careful nursing, and simple common-sense details we can favourably influence the course of these diseases.

Modern ideas with reference to the treatment of respiratory affections are in striking contrast to those held in former times. In the whole range of veterinary therapeutics no more erroneous views were entertained than with reference to these diseases, and consequently the treatment adopted was irrational in the extreme, and the results unfavourable. Vain endeavours to cut short the course of these affections, and to exert some special controlling and curative influence thereon, led to the irrational employment of bleeding, purgatives, counter-irritants, and depressants. The beneficial action of such measures was firmly believed in, and the practitioner who did not prescribe a full complement of drugs was regarded as negligent in his duty.

In the present day we recognise the fact that all depressing agents are positively injurious in such cases. We also recog-

nise the natural tendency that exists for recovery, independent of any efforts on our part, and we are aware that the frequent administration of medicinal agents is unnecessary and harmful, as it distresses and annoys the patient.

Here we may remark that no hard-and-fast rules can be laid down with reference to the medicinal treatment of respiratory affections; each case should be observed and studied, and the indications for the employment of special medicinal agents carefully considered.

The general details of treatment are similar in all acute respiratory diseases. First, proper surroundings for the patient, a well-ventilated box-stall of a proper temperature, freedom from draughts, isolation from other horses, and perfect quietness.

Needless to remark, except in veterinary infirmaries, or in the case of large firms where special hospital accommodation is provided, we are seldom enabled to obtain such desirable surroundings for our patients. Under such circumstances it is useless lecturing the owners, and the most advisable course to adopt is, by the exercise of a little tact, to suggest inexpensive improvements in the hygiene of the surroundings.

Without pure air and cleanliness it cannot be expected that respiratory affections, above all others, can progress favourably.

The next point is with reference to proper clothing of the patient. This should be regulated according to the requirements of the case, and, above all things, should not be too heavy, as it distresses the patient and may cause sweating. Care should be taken that the clothing employed is thoroughly dry, and that it is properly adjusted, so as to cause no inconvenience to the patient.

Dietetics is a very important detail in treatment of respiratory affections. Food, carefully prepared, should be allowed in small quantities and at proper intervals (see p. 34).

If the appetite fails, and all food is refused, the case becomes a very serious one, as the process of administering food in the form of drenches is dangerous and often unsatisfactory.

If the appetite continues fair it is a very hopeful sign, as the animal's strength is thus kept up in a natural manner.

A plentiful supply of pure cold water should always be left within reach of the patient. There is a prejudice against this detail in the minds of many attendants, hence the practitioner must insist on having it carried out. As a diluent, febrifuge, and diuretic, pure cold water is an important agent, and it also forms a convenient vehicle for the administration of salines.

There are many instances in which the indications for antipyretics and stimulants are apparent, but the great difficulty we have to contend with in this respect is the fact that such agents must be forced on the animal against his will.

As coughing is very easily induced by this process, there is great danger of some of the fluids gaining entrance to the trachea and bronchial tubes and setting up mechanical bronchitis. We have also to consider the irritation and distress which is caused to the patient by the administration of drenches. These risks are greatly increased when, as is too frequently the case, we have to depend on unskilled and ignorant individuals as attendants.

For these reasons many practitioners avoid the administration of drenches, and prefer to depend on simple nursing, diet, and salines in the drinking-water, medicated inhalations, and electuaries.

In cases where irritability of the pharynx and larynx is absent, and where antipyretics and stimulants are indicated, these agents can be administered in the form of bolus, provided the attendant is skilful in the giving of balls. Unfortunately, many attendants fail in this respect, and as laryngeal and pharyngeal irritability are present in many cases of respiratory affections, it follows that medicine in the solid form is persistently coughed up by the patient. In such cases medicinal agents in a semi-solid condition can be conveniently and safely administered with Hartley's 'medicine gun' (see p. 82).

On no account should active purgatives be given in

respiratory affections at any stage. The moderate dose of aloes that is advised by some authorities is not only unnecessary, but highly dangerous, as it tends to weaken and nauseate the patient, and also may induce superpurgation.

If the bowels do not act in a satisfactory manner, enemata of warm water may be given; and sufficient magnesium sulphate can usually be given in the drinking-water to act gently on the bowels. Raw linseed-oil is objectionable, as not only is there the danger of drenching to be considered, but also it has a nauseating effect and materially interferes with the appetite.

In cases characterised by persistent high fever the indications for antipyretics will require to be considered. In ordinary cases the fever tends to abate in a spontaneous manner, the simple form of treatment already mentioned being all that is necessary. Indeed, in a large proportion of cases, the forcible administration of medicinal agents can be dispensed with, and this with marked benefit to the patient. But when a persistent high temperature is present it may become necessary to prescribe antipyretics.

In our opinion these may be safely administered in the form of bolus, but, as already mentioned, there are circumstances which render this method difficult, if not impossible.

In such cases we frequently administer agents such as quinine in the form of electuary, and find that, although there is a certain amount of the drug wasted, the method has the advantage of safety and simplicity. The 'medicine gun' already mentioned can be utilised for this purpose. More especially is this form of administration safe and effectual in cases where laryngitis and pharyngitis are present, as not only do we get the effects of the medicinal agent, but also, by combining such drugs as belladonna and chlorate of potassium, we obtain the important local action of the latter agents on the parts affected. In preparing electuaries, honey forms the best basis, as horses seem to prefer it to treacle.

The question of *stimulants* in the treatment of respiratory affections is one on which differences of opinion exist. In our

experience, it is only under special circumstances that they are required; their indiscriminate employment is not only unnecessary, but injurious to the patient.

The constant drenching with alcoholic stimulants, with a view to maintain the strength of the animal, defeats its own object, if the process is carried out in the early stages of these diseases, when such agents are not indicated.

If alcohol be administered at this period it is less likely to prove of value in the secondary stages, when stimulants may be indicated.

The risks of careless drenching and the annoyance and distress caused to the patient must also be taken into consideration.

Before prescribing stimulants we must carefully examine the case.

If the animal's appetite is fair, and if the pulse gives no cause for anxiety, and there are no marked evidences of general weakness and debility, it is quite clear that stimulants are not required. If, on the other hand, there is total loss of appetite, marked constitutional weakness, and a rapid, weak pulse, it becomes necessary to prescribe stimulants in a careful and judicious manner.

If the attendant is skilful and there is an absence of marked irritability of the pharynx and larynx, the most suitable method is to prescribe carbonate of ammonia in the form of bolus. This is a very useful stimulant, but, of course, it requires to be repeated at intervals. The bolus should be well anointed with vaseline, so as to avoid irritating the pharynx and larynx.

If this form of medication be impossible, we have to resort to drenching. The amount of alcohol must be carefully computed, according to the necessities of the case, and every care taken to avoid carelessness in administration. So soon as appetite returns the drenching should be discontinued.

In cases of pharyngitis and laryngitis fluid medicines in any form must not be given, as no matter how carefully administration is carried out, some of the fluids will gain access to the bronchial tubes and produce serious results.

The value of *counter-irritation* in the treatment of respiratory affections is a vexed question. Some practitioners assert that the application of counter-irritants to the thoracic walls is not only useless, but harmful in any stage of these affections. Others, equally eminent and capable of judging results, state that in their hands counter-irritation exerts a marked beneficial influence on cases of bronchitis, pneumonia, and pleurisy. In our experience, the routine employment of counter-irritation is unnecessary, but there are cases in which the judicious application of mustard paste to the thoracic walls certainly appears to prove of benefit.

Severe counter-irritation is never called for, and cannot but prove detrimental.

In the early or congestive stages of respiratory affections, before the occurrence of effusion, the timely application of mustard appears to modify the course of the disease. We say *appears*, because we cannot definitely state what the result would have been had we omitted this detail of treatment.

But from clinical experience in these affections, we can definitely state that the routine and indiscriminate employment of counter-irritation is not necessary, and that the results recorded by practitioners who advise this line of treatment are not any more encouraging than those obtained when this detail is omitted.

A study of individual cases will lead the practitioner to recognise the indications for the employment of counter-irritation. To apply this measure in the case of a thin-skinned, nervous horse that is progressing as well as can be expected, is certainly not rational treatment; or to employ severe counter-irritation in a case of double pneumonia, when both lungs are consolidated and the animal fighting for breath, and to expect such a measure to prove beneficial, is evidently not in accordance with common-sense, while it only adds to the sufferings of the patient.

Hot applications applied to the thoracic walls give marked relief in cases of bronchitis, pneumonia, and pleurisy. Many methods have been suggested to carry out this detail in an efficient manner, but unfortunately it is difficult,

if not impossible, in ordinary practice to maintain a continuous and equable degree of heat and at the same time to avoid chilling of the surface of the body.

Rugs thoroughly wrung out of hot water are frequently employed, but the difficulty of keeping them in close contact with the surface of the chest walls, and of having them renewed at proper intervals, is quite apparent. However, as the benefits to be obtained from this treatment when carried out as thoroughly as circumstances permit are well marked, we are justified in employing it. A waterproof covering applied over the rugs is useful to maintain the heat. Linseed-meal poultices have been tried, but their weight and the difficulty in applying them have caused their use to be abandoned in equine practice.

Of late years various devices have been suggested for the purpose of applying heat to the thoracic walls. Among these, chest jackets composed of a special moss, which is capable of absorbing nine times its weight of water, are supplied by instrument makers, and prove very useful.

Appliances to contain hot water for a similar purpose have also been devised. These are expensive, and, except in a veterinary infirmary where skilled attendants are at hand, they are not likely to be applied in a proper manner.

A stimulating liniment may be applied to the walls of the chest, in order to prevent any danger of chill during the procedure of changing the hot rugs.

Medicated inhalations are of marked value in the treatment of respiratory affections. Up to the present no ideal method of carrying out this measure has been devised. The popular one of placing a bucket of hot water in a sack, and fastening the open end of the latter over the horse's head and compelling him to inhale the steam, cannot be too strongly condemned, as it simply half suffocates the animal, and thus does more harm than good. The proper method is to half fill a stable bucket with boiling water, pour in a small amount of either eucalyptus-oil or terebene, place some hay on the surface, and hold the horse's head over the escaping steam, the contents of the bucket being stirred

with a stick at intervals, so as to increase the exit of steam. Care must be taken that the horse's mouth and nostrils do not become irritated or scalded during the process. The addition of some light carbonate of magnesia to the above agents renders them more diffusible. We regard medicated inhalations as one of the most valuable details of treatment, especially in cases of laryngitis, pharyngitis, bronchitis, and broncho-pneumonia. Not only do they allay irritability of the affected structures, and facilitate expulsion of tenacious secretions, but also, by virtue of the agents they contain, an antiseptic action is exerted on the entire respiratory mucous membrane.

Space will not permit us to consider the important subject of diagnosis of respiratory affections, and the means adopted to differentiate them. For information on the subject of auscultation, percussion, etc., the reader is referred to works on veterinary medicine.

We cannot impress too strongly on the student the importance of rendering himself thoroughly proficient in these means of diagnosis, not by reading alone, but by actual examination and observation of cases, having first become familiar with the normal respiratory sounds, etc.

Here we may remark that it is not uncommon for one respiratory affection to become complicated with another, as, for example, pneumonia with capillary bronchitis, or pneumonia with pleurisy, or laryngitis may accompany or be followed by bronchitis. Again, an attack of coryza, or acute nasal catarrh, may be the precursor of a more serious affection; hence the necessity of early treatment, rest, and the avoidance of any depressing medicinal agents.

Expectoration does not occur in horses in the same manner as in human beings. Portions of the discharges from the inflamed respiratory tract issue from the nose, but the major part, when expelled from the bronchial tubes by coughing, is swallowed by the animal.

It is stated by some authorities that expectorants do not exert their special action in the larger animals. While admitting that the effect of these agents is not so apparent

in the horse as in the dog or in man, we have sufficient evidence that they do exert a beneficial action in all animals. Antimonial wine, however, which is so valuable an agent in human practice, does not in the horse appear to exert its expectorant effects. Of its use in the dog we shall speak later on.

In concluding these remarks, and before entering into a brief consideration of the special treatment that is indicated in some of the more common forms of acute respiratory affections, we may state that the practitioner who is likely to obtain the most successful results is he who is able to persuade his clients that early treatment, hygienic surroundings, and good nursing are of primary importance.

In conjunction with these details, we must admit that the simpler the treatment and the less drugging the patients receive the better.

The Treatment of Acute Nasal Catarrh, Coryza, or Common Cold in the Horse.

This may be simply an inflammatory condition of the lining membrane of the nasal chambers; or it may be associated with a variable degree of pharyngitis or sore throat, a soft cough, and slight febrile symptoms; or it may be a symptom of various respiratory affections.

Simple treatment is all that is required. On the first appearance of symptoms the animal should not be worked, but should be placed under proper hygienic surroundings.

A liberal supply of pure cold water must be allowed, in which may be dissolved moderate doses of magnesium sulphate and potassium nitrate.

Medicated inhalations give relief to the nasal irritation and promote a free discharge from the nostrils; these are administered as already mentioned.

If the cough be troublesome and evidences of pharyngitis be present, a stimulating liniment may be applied to the region of the throat.

There is no necessity for the complicated treatment ad-

vised by some authors, and on no account should the moderate dose of aloes which is sometimes recommended be given.

The affection is a simple one, and if attended to early and rationally treated, recovery occurs in a short time. As this affection appears to be of an infectious nature, it is advisable to separate the animal from others in a stable. Soft, easily-digested food should be ordered, and the animal should not be put to work until all symptoms have disappeared.

This affection is a very common one in horses brought from the country into city stables, and also in young animals purchased by dealers and placed in hot, ill-ventilated buildings. Any sudden changes in the surroundings may produce it; hence it is that when horses are newly purchased they usually become affected with what is popularly known as 'a cold.'

Simple as the affection appears to be, if the animals are neglected and irrationally treated, a serious attack of laryngitis or bronchitis may follow.

Horses showing even the slightest symptoms of nasal catarrh should not be given active cathartics of any kind.

The Treatment of Acute Laryngitis in the Horse.

This affection is often complicated with pharyngitis, and a differential diagnosis is not always possible. Two forms are recognised—viz., acute catarrhal laryngitis and œdematous laryngitis. The latter is a very serious affection, the general swelling of the structures of the throat, the infiltration of the laryngeal tissue, and the œdema of the glottis causing marked dyspnœa, and unless relief be given by tracheotomy death from asphyxia may occur.

Difficulty in swallowing, distressing cough, and interference with respiration, are the symptoms to which our attention must be directed.

In severe cases where even the swallowing of liquids is attended with difficulty, and where there is extensive swell-

ling in the region of the throat and distress in breathing, respiration being accompanied in some instances by a harsh sound, the most beneficial results are obtained by the application of a smart cantharides blister to the region of the throat; this frequently gives marked relief, and is preferable to either poultices or hot fomentations.

If the œdema of the glottis is so extensive that asphyxia is threatened, no time should be lost before performing tracheotomy; indeed, it is unwise to defer this until symptoms of marked distress in breathing, lividity of the nasal mucous membrane, an anxious expression of countenance, and restlessness are present.

Medicated inhalations are of great value, and should be diligently carried out, care being taken to avoid distressing the animal.

Eucalyptus-oil combined with camphor is the most suitable agent to medicate the steam with in these cases. The addition to the eucalyptus-oil of a small amount of light carbonate of magnesia dissolved in water renders it more evenly diffused in the hot water and more volatile.

Too large an amount of eucalyptus should not be employed, as we should avoid any irritating effect. From $\frac{1}{2}$ to 1 ounce is sufficient to a bucket of hot water.

Drenches of any kind should not be given in cases of laryngitis, as they induce violent fits of coughing, during which there is great danger of some of the fluid entering the trachea and bronchial tubes.

The electuary is the best form in which to administer medicinal agents. This may contain extract of belladonna, camphor, potassium chlorate, myrrh, honey, etc. (see formula, p 419).

Small doses of magnesium sulphate and potassium nitrate may be dissolved in the drinking-water. The food should be soft, so that it can be easily swallowed, and milk, oatmeal-gruel, linseed-tea, etc., should be allowed *ad lib.*

Pure air and healthy surroundings are of great importance. Occasionally fœtor of the breath and of the nasal discharges may be present in cases of acute laryngitis; in such it is

advisable to add either carbolic acid, cyllin, or lysol to the inhalations.

If the bowels are torpid in action, enemata of warm water should be given.

Mild attacks of laryngitis often accompany cases of acute nasal catarrh, and the treatment already suggested for that affection will suffice. It is doubtful whether we can by any means prevent the unfortunate sequelæ of acute laryngitis—viz., whistling and roaring. Some practitioners believe that counter-irritation to the region of the throat and the administration of potassium iodide after the acute attack has subsided are of benefit in this direction.

In some cases an irritable cough persists after an attack of laryngitis, the best treatment for which is the administration of heroin in doses of $\frac{1}{2}$ grain repeated three or four times daily.

A palatable preparation of this agent is supplied by chemists under the name of glyco-heroin, which contains $\frac{1}{2}$ grain of heroin in each fluid ounce in combination with ammonium hypophosphite and hyoscyamus. This is readily taken in the food or drinking-water.

The Treatment of Acute Bronchitis in the Horse.

Acute bronchitis may be met with in a comparatively mild form—*i.e.*, when affecting the larger air-tubes. When, however, a large extent of the bronchial surface becomes inflamed, and extension to the minute bronchial tubes occurs, the affection is termed 'capillary' bronchitis, and is a very serious disease. The calibre of the tubes becomes diminished by inflammatory swelling of their lining membrane, and many of these become blocked up with viscid secretion.

Cases of bronchitis in the early stages, characterised by dryness of the bronchial mucous membrane, followed in a short time by a whitish, scanty, viscid secretion, are seldom seen by the practitioner. Hence we are not able to adopt measures to modify the disease. Some practitioners state that, if the case is seen sufficiently early, a full dose of

opium will cut short the attack. This is open to doubt; and it is also questionable whether, in the horse, drugs such as antimony, given in the early stages, have the beneficial effects that are stated to occur in human beings—viz., relieving the dryness and swelling, and increasing the secretion from the bronchial mucous membrane. It is in the moist stage, or that characterised by a muco-purulent secretion from the bronchi, that we usually see these cases.

In the milder forms of bronchitis attention to hygienic and dietetic details is of great importance. These have already been considered (see p. 571). Medicated inhalations, such as have been recommended for laryngitis, should be carefully and diligently carried out.

If the case is treated in the early stages, these inhalations promote secretion and relieve irritability of the bronchial mucous membrane; if in the moist stages, they lessen viscosity of the bronchial secretion and promote its discharge from the bronchi.

If the cough be troublesome, the administration of belladonna, chlorate of potassium, and squills, in the form of electuary, will prove useful.

Medicinal agents in the form of drenches should be avoided, as fits of coughing are very easily induced in this affection, and there is danger of some of the fluid entering the bronchi.

The bowels can be regulated by administering magnesium sulphate in the drinking-water. If this agent be refused by the animal, and if the bowels do not act sufficiently, enemata of warm water may be given. Active purgatives of all kinds should be rigidly avoided.

In the more severe attacks of bronchitis, showing marked respiratory distress, a stimulating liniment applied to the chest walls and the application of rugs wrung out of hot water often give relief.

Medicated inhalations should be persevered in, and if the fever be high quinine may be given in the form of electuary.

If there be an absence of laryngeal irritability, and if stimulants be indicated, the best agent to administer is

carbonate of ammonia in the form of bolus; this possesses not only stimulant, but also expectorant, actions.

As already mentioned, there may be a difficulty in getting the attendant to administer medicine in the form of bolus; in such instances agents in the semi-solid form, administered by the 'medicine gun,' will be found safe and effectual.

In cases characterised by distressing cough and difficult respiration, we have found the administration of heroin of marked value. This, in the form of glyco-heroin, is readily taken in the drinking-water.

Capillary bronchitis must always be regarded as a serious affection, as the occlusion of the smaller bronchial tubes with viscid secretion may lead to asphyxia.

Mechanical Bronchitis is usually the result of the accidental entrance into the trachea and bronchi of medicinal agents given in the form of drenches. This varies in degree, according to the amount and the nature of the fluid which enters the trachea.

In severe cases there is marked respiratory distress, and a profuse discharge of frothy, blood-stained mucus from the nostrils. Fatal results from this form of bronchitis are not uncommon.

The treatment of this condition does not materially differ from that mentioned for the other forms of bronchitis. We must chiefly rely on medicated inhalations of steam. These should be frequently repeated, taking care, however, not to distress the animal.

Chronic Bronchitis is not so frequently met with in the horse as in the dog. It usually results from an acute attack, and is characterised by a frequent hard cough and a viscid, tenacious secretion from the bronchial tubes.

The condition known as 'thick wind' occurs as a sequel to bronchitis. Many cases of chronic cough depend on a mild form of chronic bronchial catarrh.

Asthma, eventually terminating in the condition known as 'broken wind,' is a sequel of frequent occurrence after a severe attack of bronchitis.

Chronic bronchitis is believed to be associated with a con-

striction of the smaller bronchi, which may depend on either a thickening of their lining membrane or on an irregular spasm of their muscular coat.

The treatment of the sequelæ of bronchitis is often very tedious. The hard, irritable cough may be very persistent, and ordinary treatment appears to have little effect.

Iodide of potassium gives good results in some cases, and is usually taken in the food or drinking-water. We have found that a combination of this agent with arsenic is often useful. In our experience, heroin gives the best results, and often removes the cough when all other agents have failed. It may be given in the form of glyco-heroin in the drinking-water. One ounce of glyco-heroin is equivalent to $\frac{1}{2}$ grain of heroin; and this is the usual dose, but in obstinate cases it may be increased.

The treatment of asthma and 'broken wind' will be considered further on.

The Treatment of Acute Pulmonary Congestion in the Horse.

Congestion of the lungs may occur as a precursor of pneumonia, and either in an active or passive form. It is met with in conjunction with various affections.

The affection to which we now wish to direct attention is a special form of pulmonary congestion, and is sometimes termed 'pulmonary apoplexy.' It is usually met with in hunters in soft condition that are put to severe and prolonged exertion, such as a quick run with hounds. In such instances, unless the horse is rendered fit for such work by proper training and exercise, his muscular, pulmonary, and circulatory systems are unable to stand the extra strain of a long gallop and severe exertion. The result is engorgement of the pulmonary vessels, the right side of the heart and large veins, and in severe cases extravasation of blood into the air-sacs and connective tissue of the lungs.

Marked distress in breathing, a small, indistinct pulse, tumultuous action of the heart, lividity of the nasal mucous membrane, heaving flanks, and partial sweating are the

symptoms commonly observed, indicating imperfect oxygenation of the blood and an obstructed circulation in the pulmonary vessels.

The indications for treatment in this condition are obvious—viz., to adopt measures likely to sustain the action of the heart and the pulmonary functions and to overcome the vascular engorgement. Among the simpler measures to be adopted (and these are of importance, as such cases often occur when medicinal agents are not at hand) are a free allowance of pure air, vigorous hand-rubbing of the surface of the body, the saddle-girths being first loosened, the administration of a stimulant, such as whisky or brandy, and the application of clothing.

In order to relieve the cardiac distension and venous engorgement, bleeding from the jugular is advised by some authorities. This should be carried out in the early stages if it is to prove of value. If, however, the pulsations are feeble or nearly imperceptible it should not be employed, and we must rely on full doses of stimulants. The animal should be removed to the nearest stable, and plenty of air allowed. The feet and legs should be bathed with hot water, then thoroughly dried and warmly bandaged.

As soon as possible medicinal agents should be procured. Sweet spirit of nitre, acetate of ammonia, and either whisky or brandy, should be given in moderate doses every hour or two hours, according to the gravity of the case, until the urgent symptoms disappear, and the surface of the body and extremities becomes warm. Mustard paste rubbed into the chest walls gives good results. This is a measure which is condemned by some authorities, but we have observed an appreciable benefit from its adoption. A stimulating liniment should be applied to the limbs, succeeded by hand-rubbing and the application of cotton-wool and bandages.

As this condition may be followed by pneumonia, the case must be carefully watched, and on no account should the animal be put to any work for some time.

Attention to hygienic surroundings and to dietetics is

necessary, and gradual exercise should be given when all symptoms have disappeared.

The Treatment of Pneumonia in the Horse.

Space will not permit us to enter upon a consideration of the various forms of pneumonia, or to discuss the important details of the diagnosis of this affection. For information on these matters the student is referred to works on veterinary medicine.

We must draw attention, however, to the fact that in some instances pneumonia may be present in an insidious form, and a very careful physical examination of the patient is necessary in order to detect its existence.

Another point of importance is that pneumonia frequently follows an attack of bronchitis, and also that it is often complicated with pleurisy.

In practice we find that a large proportion of the cases of pneumonia occur in conjunction with influenza, in many instances from animals being neglected and kept at work when suffering from the primary effects of catarrhal fever. Badly-ventilated stables and unsanitary surroundings have a marked influence in the production of pneumonia accompanying influenza.

Some authorities state that croupous or lobar pneumonia does not occur in the horse. However this may be, we find that post-mortem evidence and clinical histories point to catarrhal or broncho-pneumonia as being the form most commonly met with in this animal. The differential diagnosis of these varieties of pneumonia is very difficult, in consequence of anatomical peculiarities in the formation of the horse's chest; fortunately the treatment in both is similar.

Pneumonia is now recognised as depending on the presence of a specific germ, and is regarded as an infectious disease, hence isolation of affected animals is advisable.

A careful consideration of the pathology and clinical history of cases of pneumonia leads us to the conclusion that the favourable influences which we are enabled to exert on

the course of the affection, so far as medicinal agents are concerned, are very limited. We have seen the disease treated by various drugs and methods. The experience we have gained therefrom has taught us that hygienic surroundings, pure air, careful nursing, and the adoption of simple therapeutical measures, are the attributes of successful results.

From actual observation we know that many cases of pneumonia recover with practically no medicinal treatment, and from this fact we infer that the indiscriminate employment of antipyretics, stimulants, and local applications to the chest walls, is neither necessary nor beneficial. We must not, however, fall into the other extreme, and overlook the indications for antipyretics and stimulants when they are present.

The first essentials in the treatment of pneumonia are hygienic surroundings, pure air, good nursing, plenty of pure water for the patient to drink, and suitable clothing. Feeding is of the greatest importance, as should the patient's appetite fail we have a difficult case to deal with.

A reliable attendant can do a great deal in the way of tempting the animal to eat, by providing small amounts of fresh food at intervals, and by keeping the feeding utensils sweet and clean.

Salines, such as magnesium sulphate and potassium nitrate, should be given in the drinking-water. Some horses take milk readily, and this forms an excellent type of food. Grass, roots, etc., should also be allowed in judicious quantities.

If the patient takes sufficient nourishment, and the temperature is not above 105° , and tends to decline, the simple treatment mentioned is all that is requisite in the earlier stages. With a temperature above 105° and total loss of appetite, it is advisable to administer antipyretics, and of these the safest and most reliable agent is quinine.

This should be administered in the form of bolus, and repeated three or four times daily; if, however, the attendant is unable to give medicine in this form, we must

consider the advisability of prescribing it as a drench. From 1 to $1\frac{1}{2}$ drachms of quinine may be given three or four times a day, and when the temperature commences to fall and appetite returns the administration should cease.

If an irritable cough be present there is danger in administering fluids, and the quinine is best given in the form of electuary. Quinine is not only a reliable antipyretic, but it is also believed to exert a direct action on the infective morbid agent, or on the activity of the latter. It does not induce cardiac depression, like many of the modern antipyretics that have been introduced. Except when pneumonia is complicated with bronchitis, cough is not a frequent or distressing symptom. In some cases of broncho-pneumonia, however, it becomes distressing and requires attention.

We are of opinion that medicated inhalations, such as have been advised in the treatment of bronchitis, should also be employed in cases of broncho-pneumonia. Not only do they relieve distressing cough and promote expulsion of tenacious adherent mucous secretion from the air-passages, but they also exert an antiseptic influence which is of great importance.

Even in cases of pneumonia that do not show any evidences of bronchitis, but simply a rusty-coloured discharge from the nostrils, we have found that medicated inhalations, especially those containing oil of eucalyptus, give relief to the breathing, and seem to exert a favourable influence on the progress of the case.

Two conditions that may occur during an attack of pneumonia merit special attention. These are *dyspnoea* and a tendency to *cardiac failure*.

Dyspnoea occurs in varying degree, according to the extent of the lung tissue that is involved. In an aggravated form the respirations become rapid and shallow, and the case assumes a very serious aspect. This condition is believed by authorities to depend on infiltration of a large tract of lung tissue, so that the involved portion is useless for respiration. As the circulation through the lung is

interfered with, the right side of the heart becomes distended with blood, and the pulse becomes small, feeble, and rapid. In the later stages œdema of the lung also contributes to the dyspnœa.

The therapeutical measures which are likely to benefit this condition are the judicious employment of stimulants, and the diligent application of rugs wrung out of hot water to the chest-walls. In severe cases, with marked dyspnœa and a feeble, struggling pulse, the hypodermic injection of strychnine is indicated, and in some instances it acts favourably. From $\frac{1}{4}$ to $\frac{1}{2}$ grain may be given every hour until three or four doses have been administered.

In double pneumonia dyspnœa is very severe and distressing. It is far less common than the single variety, and in our experience it is very frequently fatal. It must be remembered that an attack may commence in one lung, and the other lung may subsequently become involved.

Cardiac failure is said to be the chief cause of death in pneumonia, hence its prevention is of vast importance. The obstruction to the circulation in the lung and the general venous system is considerable when a large extent of pulmonary tissue becomes consolidated; hence over-distension of the right side of the heart occurs, with a tendency to arrest in diastole. Another source of cardiac failure is believed to depend on intensity of the septic infection and of pyrexia, causing general cardiac weakness and general nervous prostration.

The prevention of cardiac failure is obviously to be attempted by the judicious employment of stimulants.

As this condition seldom occurs during the earlier stages of the disease, it is quite apparent that the use of stimulants at this period is not only unnecessary but irrational. Indeed, it may be confidently stated that unless the pulse is rapid, irregular, and feeble, and symptoms of marked weakness are present, together with loss of appetite, alcoholic stimulants are not required in the treatment of pneumonia. If given in the early stages, they are less likely to prove of value in the later stages when their use may be indicated. On

the other hand, we are well aware that if the animal refuses all forms of food, and if the above symptoms are present, it is absolutely necessary to prescribe stimulants, so as to give the patient a chance of recovery.

Great care is necessary in administering alcoholic stimulants, as in consequence of the debilitated condition of the patient there is danger of the fluid entering the trachea and bronchi. From 4 to 6 ounces of good whisky may be given with a pint of milk and four eggs beaten up three times a day.

When the pulse improves and appetite returns it is safer to cease administering drenches, as the longer the drenching is continued the more likely is the horse to resist it, and hence the greater the danger.

In these cases, when the temperature continues high, and if the attendant is skilful, we much prefer to give as a stimulant carbonate of ammonia in the form of bolus, and to combine with it quinine. Two drachms of carbonate of ammonia and 1 drachm of quinine may be given every three or four hours, or these agents may be given in a semi-solid form by means of the 'medicine gun' already mentioned.

The value of counter-irritation in pneumonia is a disputed point. From our experience, founded on the observation of a large number of cases treated with and without counter-irritants, we are of opinion that their value is more imaginary than real. It is seldom that the practitioner gets the opportunity of treating pneumonia in the very early stages; but it is only at this period—*i.e.*, before effusion has taken place—that we have observed any good effects from the application of mustard to the chest-walls.

When the disease is ushered in by severe rigors, and there is coldness of the surface of the body and extremities, then, indeed, if we are enabled to adopt treatment at this stage, we believe that a moderate application of mustard to the thoracic walls will prove of service. But, as already remarked, this is exceptional, and we fail to see how counter-irritation in any degree can favourably influence the pathological condition of the lung that is present in the later stages.

On one point we are quite confident—viz., that severe counter-irritation with either mustard or cantharides is not only uncalled for, but detrimental to the course of the disease, and we may add that the use of cantharides is totally unnecessary.

Of late years the drug known as heroin has been credited with remarkable therapeutical actions in the treatment of pneumonia and allied affections. While admitting that in some cases where irritable cough and respiratory distress are prominent symptoms this agent gives relief, we cannot believe that it exerts the wonderful influences on these diseases that are claimed by its introducers, and, in fact, we have not observed them to occur clinically.

Perhaps further acquaintance with the uses of this agent may cause us to modify our opinion; but up to the present the chief evidences of its value are found in the advertisements of chemists on the subject—very unreliable data on which to form clinical facts.

Of the many drugs that have been advised from time to time in the treatment of pneumonia it is not necessary for us to speak, further than to remark that all depressing agents should be avoided. Digitalis, according to some authorities, is useful to overcome cardiac weakness; but whatever beneficial action it may exert in this direction, its effect in interfering with the animal's appetite should lead us to avoid it. To maintain the appetite is of far more importance than trusting to drugs of this nature for problematical results.

Inhalations of oxygen have been suggested in the severe dyspnœa of pneumonia, and in the case of valuable animals they may be tried. Unfortunately, however, their use must be continuous if they are to prove of any value, as otherwise the improvement is followed by a return of the dyspnœa and the distressing symptoms in connection therewith.

Taken at their best, all that they can accomplish is to tide the patient over a critical period; more frequently, however, they simply maintain life for a short time, and the expense involved has to be taken into consideration.

The intravenous injection of an agent termed tallianine (obtained by the action of ozone upon a terpene-bearing volatile oil) has been tried by Continental and American veterinarians in the treatment of pneumonia, and favourable reports have been given on it. It is said to rapidly increase the number of leucocytes in the blood, and on this action its curative effects are believed in part to depend.

Further clinical experience in the use of this agent is desirable before an opinion can be expressed as to its value.

During the progress of a case of pneumonia the state of the pulse is a most important guide, together with the evidence furnished by auscultation and percussion. The fever usually lasts from five to eight days, sometimes longer; but we often find cases in which, although the temperature declines, consolidation of the lung increases. Hence in all cases of this disease a guarded opinion should be given with reference to prognosis.

Secondary pneumonia — *i.e.*, that form of the disease occurring as a sequel to some specific and general diseases — does not possess any special indications for treatment other than those mentioned.

Septic forms of pneumonia, and gangrene of the lung as a sequel, or extensive suppuration of the organ, may occur in debilitated cases treated in badly-ventilated, unsanitary stables. These are characterised by an abominable odour from the breath, a haggard expression of countenance, sunken eyes, marked cardiac feebleness, and a stinking dark-coloured nasal discharge, containing shreds of broken-down tissue.

Auscultation reveals secondary crepitations of a bubbling character. Treatment in such cases is of little value. All that can be done is to administer antiseptics, such as carbolic acid or cyllin, along with stimulants, and to continue inhalations of steam strongly medicated with antiseptics.

The treatment of pneumonia during convalescence is a subject of importance. We have found that the administration of potassium iodide greatly assists the absorption of the exudates, and helps to clear the respiratory surface. It may

be given in the drinking-water. We strongly disapprove of administering tonics in the form of drenches, as there is far too much risk of accidents occurring, and we have seen many cases where recovery was progressing favourably that were attacked with mechanical bronchitis as the result of careless drenching.

Food should be nourishing, and supplied at frequent intervals in small amounts. Too large feeds may derange the digestive organs, distend the stomach, and cause difficulty in respiration. Nitrogenous foods, such as oats, should only be allowed in small quantities, as, in consequence of inability to take exercise, there may be danger of over-taxation of the liver and kidneys, resulting in azoturia or a renal affection. Exercise must be gradual, and the period at which this may be commenced will depend on the strength of the patient and the condition of the lungs.

As a sequel to broncho-pneumonia a troublesome cough may persist which will require attention. The best agent for the treatment of this condition is, in our experience, heroin, given in the form of glyco-heroin three or four times daily. It is readily taken in the food or in the drinking-water.

The treatment of pneumonia may be briefly summed up as follows: Attention to hygiene and dietetics and careful nursing is of first importance. If hyperpyrexia be present the judicious administration of quinine is indicated. If possible avoid the use of drenches. Stimulants are not necessary until the condition of the pulse gives indications for their employment.

Rugs wrung out of hot water and carefully applied to the chest-walls give relief when respiratory distress is present. In order to prevent chills the fomented area should be rubbed with soap liniment. Medicated inhalations may be administered throughout the course of the case; they give relief, and also exert an antiseptic action on the respiratory mucous membrane and on the exudate. Avoid too warm clothing. During the stage of pyrexia only light clothing is required. If the bowels are not acting sufficiently enemata of warm water should be given; the ad-

ministration of magnesium sulphate in the drinking-water will also act as a laxative.

If counter-irritation be considered advisable in the early stages a mild form should be employed. Active blistering is never required, and is distinctly harmful. In the large majority of cases counter-irritants are not necessary. Avoid annoying and distressing the animal by the frequent administration of medicines. See that a liberal supply of pure water is allowed, and that proper ventilation of the stall without the occurrence of draughts is carried out.

If possible the loose-box should be heated to a temperature of 60° F. in winter weather, as cold air tends to increase the pulmonary inflammation. Needless to say, except in properly equipped veterinary infirmaries, this procedure cannot be carried out.

Bleeding, purgatives, and depressants should never be employed in the treatment of pneumonia.

The Treatment of Pleurisy in the Horse.

In pleurisy we have a general or partial inflammation of the pleura; this is succeeded by the effusion of serum and exudation of lymph.

In rare cases the effused material may become purulent. In cases that recover, the effusion becomes absorbed and the membrane returns to its normal condition.

Pleurisy is said to result from the action of cold and chills. This is doubted by some authorities, who believe that the disease has a microbic origin, and that the effect of cold, by reducing vitality, may prepare the soil for microbic infection.

However this may be, we know from experience that exposure after fatigue, and neglect of the usual precautions when horses are working in bad weather, especially those that have been recently clipped, are frequently followed by an attack of pleurisy.

This disease very frequently accompanies pneumonia, probably by extension from the affected lung; in the form of pleuro-pneumonia it is very often found in connection with influenza.

Wounds of the thorax may cause pleurisy, and a rheumatic origin is believed in by some practitioners.

In the treatment of pleurisy, similar details with reference to hygiene, dietetics, and nursing as mentioned for pneumonia should be carried out.

Special treatment is indicated in the first stages of the disease, which are often characterised by the presence of rigors, or pain which may simulate that of spasmodic colic, a short, painful, suppressed cough, pyrexia, marked stiffness in movement, and tenderness on percussion of the chest. To relieve the pain, a dose of opium, combined with raw linseed-oil to prevent its constipating effect on the bowels, is advised, or a hypodermic injection of morphine. We much prefer a moderate dose of chloral hydrate for this purpose, as, while producing an anodyne effect, it does not check intestinal action. Linseed-oil is apt to interfere with appetite.

A mild application of mustard paste to the chest-walls, followed by the diligent employment of rugs wrung out of hot water to the same region, gives marked relief, and should be continued with the precautions already mentioned to prevent chilling of the surface. Magnesium sulphate and potassium nitrate, given in the drinking-water, assist elimination and reduce the fever that is present.

At this stage we have often found the administration of sodium salicylate in doses of 2 to 4 drachms three times daily of service. This is readily taken in the food.

In the stage of effusion, when the hard, wiry pulse of the dry stage is succeeded by a soft variety, and the more acute symptoms have disappeared, little more is necessary in the way of treatment beyond keeping up the animal's strength by attention to diet, and administering saline diuretics in the drinking-water in order to promote the action of the kidneys. If the breathing is distressed to any extent, the hot applications should be continued to the chest-walls.

In mild cases the exudate becomes absorbed, but in severe cases the condition known as hydrothorax may ensue, the presence of which must be ascertained by a careful examina-

tion of the chest and observation of the special symptoms of this condition. For information on these important points the student is referred to works on veterinary medicine.

In some instances the disease appears to make little progress, the temperature remaining elevated, the pulse quick, and the breathing distressed.

In such cases most authorities recommend moderate counter-irritation by means of mustard applied to the chest-walls; this should be followed by the hot applications already advised. The exact manner in which this mild counter-irritation acts is not known, but it is believed to promote absorption of exuded materials. At the same time it is advisable to administer potassium iodide. This is the most valuable agent we possess for the purposes of stimulating absorption and promoting liquefaction of false membranes.

When we are satisfied from our examination of the case that hydrothorax is present, the question of performing the operation of *paracentesis thoracis* and withdrawing the fluid will have to be considered. If a large amount of fluid be present in the thorax and symptoms of distress be evident, we are of opinion that this operation should be performed without delay. To postpone it until prostration and debility are present in addition to the dyspnœa, and to weaken the animal's system by administering full and repeated doses of medicinal agents, in a vain attempt to cause a removal of the fluid by absorption, is not giving the patient a chance for his life.

We must remember the evil effects of a large amount of fluid in the thorax. These are overdistension and enfeeblement of the right side of the heart, and a congested condition of the lungs may be present in extreme cases. Also, firm bands of lymph may bind down the lung. The heart will suffer from the pressure of the fluid, and the lungs will become compressed. Of course, it would be unwise to perform this operation too early, as we should first wait for the natural process of absorption to occur and be guided by the symptoms that are present.

In consequence of the anatomical arrangement of the

mediastinum in the horse, the fluid is found in both sides of the chest, although the disease may exist in one side only. Sometimes, however, this natural opening in the mediastinum becomes occluded by lymph formation, and the fluid is found only in the affected side ; auscultation and percussion will decide this point.

The operation of tapping the chest is a simple one, but attention to certain details is necessary. Antiseptic precautions are of importance ; the site of operation should be thoroughly cleansed and disinfected and the instruments rendered aseptic by boiling.

The safest site is either in the eighth or ninth intercostal space, and the point to insert the trocar is midway between the inferior limit of the chest cavity and the superior limit of the fluid, this latter being ascertained by auscultation and percussion. Stretch the skin before inserting the trocar, so that when the fluid is withdrawn the puncture will be covered and air will be prevented from entering the thorax. Keep close to the anterior border of the rib, so as to avoid wounding the intercostal vessels.

The best instrument is an aspirator, but if this is not at hand a trocar and cannula, provided with a stop-cock, may be employed. If the cannula becomes blocked with fibrinous coagula, it must be carefully freed by means of a metallic probe, rendered aseptic. The opening in the skin should be cleansed with an antiseptic solution and closed with collodion.

The fluid should be removed slowly, and it is not safe to withdraw the entire amount at one time ; in some cases, after a moderate quantity has been withdrawn, the remainder will become absorbed. By removing the liquid slowly we allow a gradual return of the compressed lung to the altered physical conditions, and so avoid undesirable after-effects. In some cases, after the fluid is withdrawn, there may be an increase in the number of respirations and the condition of the pulse may indicate weakness. This probably depends on either rupture of some of the false membranes that have formed, or on a congested condition of the hitherto compressed

lung. It is generally advisable to administer a stimulant after the operation.

The tapping may be repeated in two or three days if necessary, and it is advisable to keep up the animal's strength by good feeding, and also to continue the administration of potassium iodide.

When the effusion becomes purulent in character the case is very serious. This change may occur as the result of the presence of pyogenic micro-organisms, chiefly the *Streptococcus pyogenes*, and the condition is known as empyema. It may result from infection introduced by the trocar and cannula when aseptic precautions have been neglected. These cases usually prove fatal.

The treatment advised is to withdraw the pus by a trocar and cannula. It is difficult to obtain proper drainage, and the operative procedure that is adopted in human practice—viz., to make an opening in an intercostal space or to excise portion of a rib—is not likely to be attended with successful results in the horse. However, as the case will succumb if left to itself, we are justified in endeavouring to obtain drainage by making an incision into an intercostal space and inserting a drainage-tube.

The Treatment of Asthma in the Horse.

Many authors describe asthma and that affection known as 'broken wind' or pulmonary emphysema together. While it is quite true that asthma very frequently terminates in the latter affection, and that it is often impossible to draw a distinct line between the two diseases clinically, we think it advisable to consider the treatment of each in a separate manner, for the following reasons: Asthma depends on spasm of the bronchial muscular tissue; it may occur in a sudden manner and disappear in a variable time. The expirations are jerky and have not that characteristic double movement of the flanks that is present in cases of 'broken wind.' This will explain the cases of the latter disease that are said to develop suddenly, and also the so-called cures that are said to occur from the use of certain patent nostrums.

From a medico-legal point of view, the sudden occurrence of a disease simulating 'broken wind' is of importance, and we believe that in such instances the affection is in reality asthma.

It is said that some cases of asthma recover completely, but it is very likely that if their after-history could be traced they would be found ultimately to develop into 'broken wind.'

Asthma is a frequent sequel to a severe attack of bronchitis, and a condition of chronic bronchial catarrh is often found to be present.

In some instances it appears to originate in an obscure manner. It is characterised by a peculiar wheezing sound on auscultation, by intermittent attacks of dyspnoea, a troublesome cough, and a slight discharge of thick mucus from the nostrils. Clinically, it is very difficult to distinguish the exact period when asthma merges into 'broken wind,' and the two conditions may be combined in varying degrees of severity.

In the treatment of asthma, we must remember that the prognosis must be doubtful and a guarded opinion should be given. The chief indication is to relieve bronchial spasm and troublesome cough, and to pay attention to diet.

Laxatives, such as magnesium sulphate, should be given in the food or drinking-water. Bulky food must be avoided; hence the supply of hay should be limited.

Inhalations of steam containing terebene prove very useful in relieving cough and bronchial spasm.

Stimulating liniments should be applied to the chest-wall. Some authors recommend counter-irritation by means of mustard paste. Various drugs have been tried in the treatment of asthma, but in many instances the affection terminates in 'broken wind' in spite of treatment.

We have found heroin, in the form of glyco-heroin, superior to all other agents in this condition. Of course, its action in many cases can only be palliative, but it appears to exert a special effect on the bronchial spasm and on the irritable cough.

Tar-water is also useful. It may be conveniently prepared

by pouring water into a barrel containing a small amount of Stockholm tar. Horses dislike it at first, but after a time take it without difficulty.

Iodide of potassium in moderate doses may be combined with heroin, and sometimes produces good results.

The Treatment of 'Broken Wind,' or Pulmonary Emphysema.

As this affection depends on emphysema of the lungs, it is quite clear that treatment cannot be curative, but simply palliative. Nevertheless, there are many mild cases in which, by careful attention to diet and the judicious employment of medicinal agents, the animals may be rendered useful for a long period so far as light work is concerned. Although a certain proportion of cases follow asthma and occur as a sequel to bronchitis and broncho-pneumonia, the majority come on insidiously and have their origin in reflex irritation from the stomach and intestines, depending on dietetic causes.

The dietetic origin of 'broken wind' is proved by many circumstances in connection with the development of the disease, which space will not permit us to discuss here; but it leads us to recognise one important indication for treatment—*i.e.*, attention to diet as of first importance.

Hay should be restricted as much as possible, and if the animal has the habit of eating his bedding, a muzzle must be employed. Young furze (gorse) well chopped is an excellent addition to the diet in these cases.

Linseed-oil should be occasionally mixed with the food, and if the bowels are inclined to be costive, magnesium sulphate is useful as a laxative.

Many agents have been tried in the treatment of 'broken wind'; depressants, such as aconite, tartar emetic, and hellebore, by their sedative action on the stomach, give temporary relief to the dyspnœa and relieve the cough. These form the constituents of certain patent preparations which are said to benefit this disease; but, as might be expected, the results are only temporary.

In the reputed cures of 'broken wind' and chronic cough it is probable the conditions were in reality those of asthma.

Tar-water is useful in the treatment of broken wind. Not only does it exert a sedative action on the respiratory surface, but it also prevents flatulence, the latter being a frequent symptom in this disease.

Of medicinal agents that prove of special value, arsenic gives the best results. It is readily taken in the food in the form of Fowler's solution, and where dyspnoea is severe we have obtained good results by the addition of belladonna.

In the case of favourite horses, where expense is not objected to, we have found that heroin combined with hyoscyamus gives remarkable relief. Of course, the use of the drug has to be continued in order to prove of any practical value. Occasional laxatives, such as Epsom salt or linseed oil, should be given in the food.

Animals suffering from this affection should not be worked soon after feeding, and large amounts of food should not be given at one time.

Advanced cases often suffer from dilatation of the right side of the heart, and it is quite apparent that they are only suited for slow work.

The prevention of this disease is of importance. It is most commonly met with in round-chested horses, cobs, and ponies, that do little work and have a tendency to eat their bedding. Unless bulky food is curtailed, proper exercise given, and the early symptoms observed and treated, the disease is very apt to develop.

One of the earliest symptoms is a cough of a short, hard character, and easily induced; this is known as a 'chronic' cough. Later on it develops into the characteristic cough of broken wind—viz., suppressed and shallow in character, and is accompanied by the type of respiration that is peculiar to this affection—viz., a double expiratory movement.

A persistent cough of the above description should never be neglected, and the best treatment in our experience is a

combination of arsenic and heroin, continued until a decided improvement is observed, then gradually discontinued. At the same time the diet must receive attention, otherwise medicinal treatment is useless.

THE TREATMENT OF RESPIRATORY DISEASES IN THE DOG.

In this animal the same general principles of treatment will apply as in the horse. Medicinal agents are more easily administered, and as a rule a more accurate diagnosis in these affections can be made.

Kennels well ventilated and capable of being heated to a proper temperature during cold weather are a necessity in the treatment of the respiratory diseases in this animal, while careful nursing is of the utmost importance.

Acute Nasal Catarrh.—In this condition early attention is desirable, as it may be the precursor of a more serious affection. If the bowels are not acting properly a dose of castor-oil with olive-oil may be given. Inhalations of steam medicated with oil of eucalyptus give relief to the inflamed nasal mucous membrane.

If fever be present, and an irritable cough depending on extension of the disease to the pharynx, a febrifuge and diaphoretic mixture combined with ipecacuanha may be given (see formula, p. 609).

When the acute stage has passed, if the animal appears depressed and the appetite indifferent, from 1 to 2 grains of quinine may be given three times a day. The diet should be light and nourishing, consisting of milk, broths, beef-tea, etc.

Acute Laryngitis.—In this affection inhalations of steam medicated with oil of eucalyptus give marked relief. In the early stages the compound ipecacuanha powder (Dover's powder) may be given twice daily, in doses of 5 grains and upwards, according to the size of the dog. This relieves the irritable cough and the difficulty in swallowing which is present in some cases.

An alkaline mixture containing chloride of ammonium and

ipecacuanha wine is useful if the cough continues hard and dry (see formula, p. 609).

Fluids should be administered slowly, and by distending the buccal pouch with the finger and pouring the medicine therein, it is usually swallowed without danger of any entering the trachea.

In cases where deglutition is very difficult, an electuary containing potassium chlorate, honey, glycerin, and syrup of Tolu may be given.

Local treatment is of importance, but it is difficult to maintain hot applications to the region of the throat.

We find that a stimulating liniment rubbed into the region of the pharynx and larynx (see formula, p. 609), and followed up by the application of a thick layer of 'thermofuge' (see p. 88), gives excellent results, and acts far better than either poultices or fomentations.

If œdema of the glottis supervene (a rare occurrence in our experience), and if alarming dyspnœa be present, tracheotomy must be performed.

Chronic Laryngitis, evidenced by a dry, husky cough, which increases in severity at times, the animal coughing up a whitish-gray frothy material, is best treated by inhalations of steam medicated with terebene, pinol, or camphor. The application of tannin and glycerin (10 grains to the ounce) to the interior of the larynx by means of a camel-hair brush is often of benefit.

A mixture containing potassium iodide, heroin, tincture of hyoscyamus, and camphor-water proves useful when the cough is irritating and persistent.

Acute Bronchitis is best treated by medicated inhalations, expectorants, and careful nursing. It is absolutely necessary to have the kennel in which the animal is to be treated kept at a temperature of from 65° F. to 70° F., and we find it of advantage to have steam medicated with oil of eucalyptus diffused around the animal, by means of a kettle having a long, wide spout, and kept constantly boiling. This moistens the air, and renders it unirritating and more easily breathed.

The application of flannels wrung out of hot water and

applied to the chest gives marked relief in the early stages. The difficulty is to get them retained in position, and, in the case of dogs with long coats, to prevent chilling during the process.

We have found that in fine-coated dogs an excellent substitute is a thick layer of 'thermofuge,' applied to the chest-walls, and covered over with Gamgee wool made into the form of a jacket.

During the dry stage the indications are to relieve the dryness, swelling, and sensitiveness of the bronchial mucous membrane, and to promote secretion therefrom. These can be accomplished by the administration of compound ipecacuanha powder. Some practitioners prefer small doses of antimonial wine, and believe that it has a special action in promoting bronchial secretion. From 5 to 10 minims of the latter agent may be given at intervals, care being taken to cease its administration should nausea result.

A combination of antimonial wine with an opiate has been found useful, but we prefer to combine it with heroin instead, as the after-effects of either opium or morphine are usually nausea, constipation, loss of appetite, etc. The above may be given every three hours until the symptoms are relieved (see formula, p. 610). Medicated inhalations should be administered at frequent intervals.

After the symptoms of the dry stage have passed off, which is usually in from twenty-four to forty-eight hours, the antimony and heroin mixture may be discontinued, and a mild stimulating expectorant prescribed, such as a combination of sodium bicarbonate, ammonium carbonate, syrup of Tolu, and infusion of senega (see formula, p. 610).

Capillary bronchitis is a very fatal form of this disease in the dog, and requires prompt treatment.

In order to cause the removal of viscid secretions from the bronchial tubes, an emetic should be administered. The best agent is ipecacuanha, either in the form of powder or of vinum ipecacuanhæ. From 10 to 20 grains of the powdered drug, or $\frac{1}{2}$ to 1 drachm of the wine, may be given in a tablespoonful of syrup and water. By this procedure

not only is expectoration promoted, but also the act of vomiting causes expulsion of catarrhal secretion from the bronchial tubes.

In the secondary stages stimulating expectorants should be given, composed of ammonium carbonate, tincture or syrup of squills, spirit of chloroform, and infusion of senega (see formula, p. 610). These may be repeated every four hours.

If the cough is distressing, moderate doses of compound tincture of camphor may be added to the above; but the danger of administering opium in any form in these cases must be remembered, as, although it relieves the cough by lessening the sensibility of the bronchial mucous membrane, this effect interferes with the expulsion of the secretions that are obstructing the air-passages.

If indications for the employment of stimulants are present, either port wine or brandy should be given. The doses should be small and repeated at intervals, as otherwise nausea and vomiting may result.

In all cases in canine practice care must be taken to avoid administering either food or medicines that are likely to irritate the stomach, induce nausea, and thus cause vomiting. If the appetite is thus interfered with, loss of strength soon follows.

In cases where dyspnoea is very severe and the action of the heart weak and struggling, the hypodermic injection of strychnine should be employed. It is especially valuable in the later stages of capillary bronchitis, and produces good effects by maintaining cardiac action and acting as a stimulant to the respiratory centre.

Inhalations of oxygen may be given at the same time. During convalescence from bronchitis great care should be taken to avoid exposure to cold, and it is generally advisable to put the animal on a course of cod-liver-oil emulsion, with hypophosphites.

Chronic bronchitis is best treated with medicated inhalations. These may contain either terebene or compound tincture of benzoin.

Many medicinal agents have been suggested in the treat-

ment of this condition—*e.g.*, expectorants such as squill; also agents to modify the morbid secreting action of the respiratory mucous membrane, such as balsams of Peru and Tolu, the compound tincture of benzoin, etc.

When every agent seems to fail, we have obtained good results from the administration of heroin, combined with small doses of potassium iodide.

Chronic bronchitis in aged fat dogs is frequently followed by asthma, the treatment of which will be considered later on.

Pneumonia.—The indications for treatment of this disease in the dog are similar to those mentioned for the horse. The most reliable antipyretic agent is quinine, which may be administered in doses of from 1 to 2 grains, combined with 5 grains of ammonium carbonate, every three hours in the form of mixture (see formula, p. 612). In severe cases and in large dogs these doses may be increased.

If pleurisy accompanies pneumonia, a varying degree of pain may be present, and to relieve this a mixture containing Dover's powder, acetate of ammonia, and camphor-water may be given until relief is obtained (see formula, p. 612).

The state of the pulse will indicate the necessity for alcoholic stimulants, and care should be taken not to administer these in too large doses; otherwise they will be rejected by the stomach, and do more harm than good.

In severe dyspnoea and weak, irregular cardiac action, the hypodermic injection of strychnine and inhalations of oxygen will become necessary.

If cough be a distressing symptom, it may be relieved by the administration of heroin and the employment of medicated inhalations. The latter are especially valuable in cases of broncho-pneumonia.

With regard to local applications in pneumonia, the difficulty in applying either hot flannels or poultices to the chest-walls in dogs is well known. We prefer to apply a stimulating liniment and a jacket of Gamgee wool.

In small dogs a good layer of 'thermofuge' forms an efficient mode for applying heat and moisture, and is far

preferable to other measures. Counter-irritants are totally unnecessary in the treatment of respiratory affections in the dog.

Careful nursing and attention to feeding should be carried out. In cases of marked exhaustion and cardiac weakness, hypodermic injections of ether combined with caffeine sometimes prove useful. From 20 to 30 minims of ether, with 3 to 6 grains of caffeine, may be injected at intervals as required. The caffeine is dissolved in distilled water with the aid of sodium salicylate, as follows: caffeine, 1 drachm; sodium salicylate, 45 grains; warm distilled water, $1\frac{1}{2}$ drachms. Of this mixture 9 minims are equivalent to 6 grains of caffeine.

In severe vaso-motor exhaustion following the crisis of pneumonia, the intravenous injection of adrenalin may be tried. From 1 to 2 minims of the 1 to 1,000 solution should be diluted with 20 parts of normal saline solution, and frequently repeated, as the action of the drug in raising the blood-pressure is very transitory.

During convalescence the animal must be carefully protected from cold, and tonics combined with cod-liver-oil emulsion are indicated.

Pleurisy.—In the dry stage, a moderate dose of mercury with chalk (gray powder) may be given to act on the bowels. For the relief of pleuritic pain, the best agent is Dover's powder, combined with acetate of ammonia and camphor-water (see formula, p. 612). This may be given every three or four hours until the pain is relieved. Local applications to the chest-walls may be carried out as advised under pneumonia.

In some cases sodium salicylate is useful, especially if much fever be present. During the stage of effusion, potassium iodide is indicated in order to promote absorption. Should hydrothorax occur with marked dyspnœa, the operation of paracentesis thoracis must be carried out.

Asthma.—In the dog this may occur as a sequel to chronic bronchitis, but in old obese, overfed house-dogs it may develop in an insidious manner, and is regarded as a respiratory neurosis by some authors.

A large number of drugs have been tried in the treatment of both forms of this affection, and it is difficult to decide the agent which suits individual cases. In severe fits of spasmodic asthma, the hypodermic injection of morphine often gives marked relief. The inhalation of nitrite of amyl is also useful.

During the paroxysm it is dangerous to administer medicines of any kind by the mouth. Inhalations of the fumes produced by burning stramonium and nitre-paper (paper soaked in a saturated solution of nitre) may also be tried.

Iodide of potassium gives good results in many cases, and may be combined with stramonium and spirit of chloroform.

In bronchial asthma we have found a combination of heroin with potassium iodide one of the most reliable forms of treatment.

Arsenic is beneficial in some cases, and in the form of sodium arsenate may be combined with nux vomica.

When asthma is associated with pulmonary emphysema, but little can be done beyond administering arsenic and potassium iodide. In most cases of advanced pulmonary emphysema, dilatation of the right side of the heart is present.

Attention to diet and to the state of the bowels is essential in the treatment of asthma. Bulky food should be interdicted, and purgatives must be given when necessary. Overfeeding is especially to be avoided.

FORMULÆ.

Electuary for Acute Laryngitis in the Horse.

R	Ext. belladonnæ vir.	...	...	ʒii.
	Potassii chlorat.	...	...	ʒii.
	Glycerini	...	...	ʒii.
	Mellis	...	...	ad ʒviii.

M. F. elect. Sig.: Give a tablespoonful on the back of the tongue three times daily.

Fever Powders in Respiratory Affections of the Horse.

R Mag. sulph. ʒxii.
 Potassii nit. ʒii.

M. Div. in pulv. vi. Sig.: Give one twice a day in the drinking-water.

Mixture for Hyperpyrexia in Cases of Pneumonia in the Horse.

R Quininæ sulph. ʒi.
 Ac. sulph. dil. q.s.
 Aquæ ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours in half a pint of linseed-tea.

Febrifuge Mixture in Acute Nasal Catarrh, with Fever and Irritable Cough, in the Dog.

R Potassii cit. grs. xl.
 Spts. æth. nit. ʒiv.
 Liq. ammonii acet. ʒii.
 Vini ipecac. ℥ xl.
 Aquæ camphoræ ad ʒviii.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every four hours.

Mixture for the Early Stages of Acute Laryngitis in the Dog.

R Sodii bicarb. ʒi.
 Ammonii chloridi ʒi.
 Vini ipecac. ʒi.
 Spts. chloroformi ʒi.
 Aquæ camphoræ ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every three hours in a little warm water.

Inhalation for Laryngitis and Bronchitis in the Dog.

R Ol. eucalypti ʒii. to ʒiii.
 Magnesii carb. levis ʒi. to ʒi.ss.
 Aquæ ad ʒiii.

M. Sig.: Mix a teaspoonful of this mixture with a pint of water at 150° F., and use as an inhalation three times a day.

Stimulating Liniment for applying to the External Region of the Throat.

R Ol. pini sylvestris ʒii.
 Lin. camphoræ co. ʒiv.
 Lin. saponis ad ʒi.ss.

M. F. lin.

Cough Mixture in Chronic Laryngitis in the Dog.

R Potassii iod. ...	...	...	grs. xl.
Glyco-heroin ...	...	...	̄vi.
Syr. Tolu ...	...	...	̄i.ss.
Aquæ camphoræ ...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three or four times daily.

Mixture in the Early Stages of Acute Bronchitis in the Dog.

R Pulv. ipecac. co. ...	...	...	̄i.
Spts. æth. nit. ...	...	...	̄i.ss.
Liq. ammonii acet. ...	...	...	̄iv.ss.
Aquæ camphoræ ...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful twice daily until relief is obtained.

Or :

R Vini antimonialis ...	...	...	̄ii.
Glyco-heroin ...	...	...	̄vi.
Aquæ camphoræ ...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every three hours, and less frequently as the symptoms are relieved.

Mild Stimulating Alkaline Expectorant Mixture in Bronchitis in the Dog.

R Sodii bicarb. ...	...	...	̄i.
Ammonii carb. ...	...	...	grs. xxiv.
Syr. Tolu ...	...	...	̄iii.
Infusi senegæ ...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful twice daily.

Pills to be given at the same Time as the above Mixture.

R Quininæ sulph. ...	...	...	grs. i.ss.
Pulv. ipecac. ...	...	...	gr. ¼.
Excipient. ...	...	...	q.s.

F. pil. i. Mitte xii. Sig.: Give one three times daily.

Stimulating Expectorant Mixture in the Secondary Stages of Capillary Bronchitis in the Dog.

R Ammonii carb. ...	...	...	grs. xx.
Tinct. scillæ ...	...	...	̄i.
Spts. chloroformi ...	...	...	̄i.ss.
Infusi senegæ ...	...	...	ad ̄vi.

F. m. Give from two teaspoonfuls to a tablespoonful every four hours.

Mixture for Bronchitis in Debilitated Cases in the Secondary Stage in the Dog.

R Ammonii carb.	...	...	̄ss.
Vini ipecac.	...	...	̄ss.
Tinct. cinchonæ co.	...	...	̄vi.
Aquæ chloroformi	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every four hours.

Mixture for Acute Bronchitis in the Dog when Cough is Distressing.

R Potassii citratis	...	...	̄ss.
Vini ipecac.	...	...	̄ii.
Tinct. camph. co.	...	...	̄ss.
Liq. ammonii acet.	...	...	̄iii.
Aquæ chloroformi	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every four hours.

Mixture for Chronic Bronchitis in the Dog.

R Tinct. benzoin co.	...	...	̄ii.
Syr. scillæ	...	...	̄vi.
Vini ipecac.	...	...	̄ss.
Syr. Tolu	...	...	̄vi.
Mucilaginis acaciæ	...	...	̄iv.
Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times daily.

Tonic and Expectorant Mixture for Chronic Bronchitis in the Dog.

R Ammonii carb.	...	...	̄i.
Tinct. nucis vom.	...	...	̄i.
Tinct. cinchonæ co.	...	...	̄vi.
Spts. chloroformi	...	...	̄ss.
Infusi senegæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times daily.

Mixture for Chronic Bronchitis in the Dog.

R Potassii iod.	...	...	grs. xxx.
Glyco-heroin	...	...	̄vi.
Syr. Tolu	...	...	̄vi.
Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times daily.

Inhalation for Chronic Bronchitis in the Dog.

R Terebeni	...	...	...	̄ss.
Magnesii carb. levis.	...	...	...	grs. xx.
Aquæ ferventis	...	...	...	O.ss.

M. Sig.: Use as an inhalation three times daily.

Mixture for Pneumonia in the Dog.

R Quininæ sulph.	...	...	...	grs. xxxvi.
Syr. aurantii	...	...	...	̄i.ss.
Aquæ	...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful, along with a similar amount of No. 2 mixture every three hours.

No. 2. Mixture.

R Ammonii carb.	...	...	...	̄ii.
Syr. aurantii	...	...	...	̄i.ss.
Aquæ	...	...	...	ad ̄vi.

F. m. Sig.: From two teaspoonfuls to a tablespoonful along with the above mixture.

Mixture for Pneumonia accompanied by Pain due to Pleurisy as a Complication.

R Pulv. ipecac. co.	...	...	...	grs. v. to grs. x.
Liq. ammonii acet.	...	...	...	̄ii. to ̄iii.
Aquæ camphoræ	...	...	...	ad ̄i.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful, and repeat every four hours until relief is obtained.

Febrifuge Mixture for the Dog in the Early Stages of Pneumonia or Pleurisy.

R Potassii citratis	...	...	...	̄ss.
Spts. æth. nit.	...	...	...	̄vi.
Liq. ammonii acet.	...	...	...	̄iii.
Aquæ chloroformi	...	...	...	ad ̄vi.

F. m. Give from two teaspoonfuls to a tablespoonful every four hours.

Mixture for Pneumonia in the Dog after the Critical Stage has passed.

R Ammonii carb.	...	...	grs. xl.
Tinct. nucis vom.	...	...	ʒi.
Spts. chloroformi	...	...	ʒi.
Tinct. gent. co.	...	...	ʒiv.
Syr. aurantii ...	...	...	ʒi.ss.
Aquæ ...	...	...	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times daily.

Acid Tonic Mixture during Convalescence from Pneumonia.

R Ac. nitrici dil.	...	...	ʒi.
Tinct. cinchonæ co.	...	...	ʒvi.
Syr. aurantii ...	...	...	ʒi.ss.
Aquæ chloroformi	...	...	ad ʒvi.

F. m. Give from two teaspoonfuls to a tablespoonful three times daily.

Mixture for the Dog in the Secondary Stages of Pleurisy.

R Potassii iod.	...	...	grs. xxxvi.
Potassii bicarb.	...	...	ʒiii.
Tinct. digitalis	...	...	ʒi.ss.
Tinct. scillæ ...	...	...	ʒss.
Spts. ammon. aromat.	...	...	ʒss.
Aquæ camphoræ	...	...	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every four hours.

Diuretic Powders in Cases of Pleuritic Effusion in the Dog.

R Caffeinæ	...	...	grs. xl.
Sodii benzoatis	...	...	grs. xl.

M. Div. in pulv. viii. Sig.: Give one every three or four hours in a little water.

Mixture for Asthma and 'Broken Wind' in the Horse.

R Ext. belladonnæ vir.	...	...	ʒi.ss.
Sodii bicarb.	...	...	ʒi.ss.
Liq. arsenicalis	...	...	ʒv.
Aquæ ...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls in the food or drinking-water three times daily.

Or :

R Potassii iod.	℥v.
Ext. belladonnæ vir.	℥ii.ss.
Glyco-heroin	℥v.
Aquæ	ad O.i.

F. m. Sig.: Give two wineglassfuls three times daily
in the food or drinking-water.

Mixture for Asthma in the Dog.

R Potassii iod.	℥i.
Glyco-heroin	℥vi.
Spts. chloroformi	℥ii.
Aquæ camphoræ	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoon-
ful three times daily.

Arsenical Mixture for Asthma in the Dog.

R Liq. arsenicalis	℥xxxvi.
Spts. ammon. aromat.	℥iv.
Spts. chloroformi	℥ii.
Syr. Tolu	℥iv.
Aquæ camphoræ	ad ℥vi.

F. m. Sig.: Give from two teaspoonfuls to a table-
spoonful three times daily.

CHAPTER XIV

THE TREATMENT OF DISEASES OF THE HEART

IN considering this subject, we must first draw attention to a few important points in connection with cardiac diseases in the horse.

In the first place, chronic organic cardiac affections in this animal possess very little interest for the therapist. If we are satisfied of their existence, we are aware that horses so affected are neither safe nor fit for work, and that treatment can only be palliative.

In the next place, the diagnosis of cardiac diseases is attended with a great deal of uncertainty, more especially in the differentiation of one form of heart disease from another. The position of the heart in horses renders a proper examination of this organ very difficult. We know from post-mortem experience that even far-advanced cardiac diseases may exist in some cases without their presence being detected during life. Very often the symptoms are obscure, and may be attributed to other causes.

Pages might be filled with details of the differential diagnosis of the various forms of organic cardiac disease in the horse, but these prove to be purely theoretical and of little value in clinical work. The important practical point in diagnosis is to distinguish those cases which are amenable to treatment from those in which therapeutic measures cannot render the animals either safe or useful.

Functional cardiac disorders must be carefully distin-

guished from organic affections. In practice this is not so easy as might be inferred from the stereotyped descriptions given in some text-books.

Great discrimination is necessary in order to avoid serious errors, and repeated examinations of the patient may be required before we are able to decide whether the symptoms present depend on a disorder of cardiac innervation—*i.e.*, a functional affection—or on structural disease of the heart.

A practical acquaintance with auscultation of the normal heart is necessary in order to detect the alterations produced by disease.

Space will not permit us to consider this subject, nor can we enter into the details of the diagnosis of cardiac affections. For full information on these points the student is referred to works on veterinary medicine, and we may remark that in order to render this knowledge of any practical value it must be supplemented by careful clinical study and observation.

We shall first consider the treatment of functional cardiac affections, and we may remark that the symptoms indicative of their presence may also co-exist with those of structural disease of the valves and walls of the heart. On the other hand, an irregular or intermittent cardiac action may occur during the course of a functional disorder; hence the necessity for careful discrimination, in order to avoid the consequences of an erroneous diagnosis.

The Treatment of Cardiac Palpitation in the Horse.

Palpitation is an irregular or forcible action of the heart, the cardiac contractions being increased in force and rapidity. It may occur at intervals and then pass off, or it may be continuous, with varying degrees of severity. It occurs as a symptom in various forms of structural cardiac disease.

Palpitation occurring in the absence of organic cardiac disease is regarded as depending on disorder of the vasomotor nerves, or on reflex irritation of the cardiac nerves. It may be due to anæmia or to dyspepsia, and is often

found to be present during convalescence from diseases such as influenza. Some obscure cases are met with, especially in animals of a nervous, excitable temperament.

The treatment of cardiac palpitation will obviously depend on the cause of the disorder.

When occurring as a sequel to influenza, attention to diet is necessary, nourishing food should be allowed, and gentle exercise given.

Iron and *nux vomica* are the agents which succeed best as cardiac tonics in such cases, and may be given in the food (see formula, p. 628). If the appetite is poor, medicines cannot be given in the food, and the agents should be administered in the form of bolus twice daily.

In some cases a combination of the citrate of ammonia and quinine, bromide of soda, and *nux vomica* gives good results (see formula, p. 628).

Digitalis is recommended by some authors, but in our experience it simply exaggerates the symptoms and, besides, interferes with appetite. If the palpitation is excessive, bromide of potassium in full doses, with *hyoscyamus*, may be given until relief is obtained.

When depending on dyspepsia, flatulency, or on reflex irritation from the presence of intestinal parasites, these conditions will require appropriate treatment.

In anæmic cases preparations of iron are indicated.

The Treatment of Acute Pericarditis in the Horse.

Acute inflammation of the pericardium is occasionally met with as an idiopathic affection. Some authors believe that it may occur, especially in young horses, as the result of exposure to cold and general neglect.

The majority of cases are found to be secondary to other affections, such as acute rheumatism, pleurisy, pleuro-pneumonia, influenza, and occasionally renal disease.

Clinically, it is very difficult to differentiate pericarditis from endocarditis, *i.e.*, inflammation of the lining membrane of the heart, and the two affections are frequently combined.

In the bovine species the disease may occur in the traumatic form, resulting from a sharp foreign body having found its way to the pericardial sac from the stomach.

In pericarditis, in addition to fever and general constitutional disturbance, we find in the first or dry stage an irritable tumultuous action of the heart and a hard, quick pulse. On auscultation, a friction sound may be heard.

When serous effusion into the pericardium takes place the friction sound is lost, and the pulse becomes weaker and softer. As the effusion increases the sounds of the heart become muffled; occasionally a dull churning sound may be detected. In some cases, although the beats of the heart are violent and irregular, the pulse may be feeble.

Among other symptoms observed are a distinct jugular pulse and spasms or cramp of the superficial muscles, especially those of the pectoral and cervical regions; a cough may also be present.

Treatment in the early stages should be directed to regulate cardiac action and lessen its rapidity, and thus exert a favourable influence on the pericardial inflammation, also to relieve distress. In the secondary stages the absorption of the effusion must be promoted by suitable means, and if these fail, the fluid must be removed by operation.

Aconite is recommended by some authors to allay cardiac irritability, and, combined with alkalies, we have often found this agent very useful in the early stages; but it must be used with discretion, and should not be continued too long.

The application of rugs wrung out of hot water over the region of the heart relieves distress and pain.

In rheumatic cases—and we may remark that the majority come under this category—we prefer either sodium salicylate or salicin (in combination with an alkali, such as potassium bicarbonate), to aconite, for reducing cardiac action. These have not so depressing an action as aconite, and, besides, they exert a special effect on the rheumatic condition.

Pain and distress may be prominent symptoms in peri-

carditis, and to relieve these a hypodermic injection of morphine may be given, or a moderate dose of chloral hydrate.

During the stage of effusion the iodide of potassium combined with digitalis is indicated.

Digitalis, however, is a drug which does not suit every case of pericarditis. It should never be given in the early stages, and if in the later stages it appears to increase the cardiac disturbance, it should be omitted.

Counter-irritation by means of mustard applied to the cardiac region is found useful to promote absorption of the effusion.

Magnesium sulphate combined with potassium nitrate should be administered in the drinking-water.

Should the bowels not act satisfactorily, enemata of warm water may be given, but on no account should purgatives be administered.

The general comfort of the patient, proper nursing, and diet must receive attention.

In cases where debility and a feeble pulse are present the judicious administration of stimulants is indicated.

When the effusion is extensive and has resisted the treatment suggested, and when it compresses the heart, thus causing marked interference with cardiac action and dyspnœa, operative measures are indicated.

The fluid should be withdrawn with an aspirator or a small trocar and cannula. The trocar or aspirating needle is introduced between the cartilages of the fifth and sixth ribs on the left side, and carefully directed upwards and inwards, so as not to wound the heart.

Strict antiseptic precautions must be observed, and if a trocar and cannula be employed, it is advisable to attach a long rubber tube to the latter and plunge its lower end into a vessel containing an antiseptic solution; this will prevent the entrance of air and micro-organisms. The fluid should be slowly withdrawn. A stimulant is usually necessary after the operation.

The Treatment of Acute Endocarditis in the Horse.

Inflammation of the endocardium rarely occurs as an independent affection; it is usually a complication of acute rheumatism, and is also met with in pyæmia, septicæmia, and in the rheumatic form of influenza.

Pericarditis and endocarditis are frequently combined, and some authors believe that the double lesion is the commonest organic cardiac affection met with in the horse.

Endocarditis must always be regarded as a serious affection, in consequence of the lesions it usually induces in connection with the cardiac valves.

It is very difficult to differentiate endocarditis from pericarditis, in consequence of the similarity of the symptoms in each.

Venous regurgitation and dyspnœa are more marked in endocarditis, while the presence of abnormal sounds, such as 'bellows murmurs,' may serve to distinguish it from pericarditis.

The late Professor Williams believed 'that clonic spasms of the superficial muscles, hurried breathing, and a tendency to syncope, if the head be suddenly elevated or the animal in any way disturbed,' are more marked in endocarditis than in any other cardiac affection ('Principles and Practice of Veterinary Medicine').

In the treatment of endocarditis two important indications must be kept in view. In the first place, as the majority of cases depend on rheumatism, we administer agents that are likely to exert a modifying action on the blood—*i.e.*, to counteract the irritating effect of the rheumatic poison on the endocardium. For this purpose alkalies, such as bicarbonate of potassium and bicarbonate of sodium, should be prescribed, and care should be taken that plenty of water is allowed for the animal to drink.

The next indication is to reduce excessive cardiac action, and so prevent the abnormal activity of the valves, which tends to increase the inflammatory changes.

Aconite is sometimes advised for this purpose, but in our

opinion it is too depressing an agent. Salicylate of sodium is far preferable, as it not only moderates and reduces excited cardiac action, but also antagonises the rheumatic element in the system.

If marked debility be present, and if it be considered that even salicylate of sodium may exert depressing effects, salicin may be given instead, combined with alkalies. From 1 to 1½ drachms of salicin with 2 to 3 drachms of potassium bicarbonate or sodium bicarbonate may be given every three hours.

If there be evidence of pain and distress we may administer ½ ounce of Dover's powder, and apply hot fomentations to the region of the heart, followed by the application of a paste composed of belladonna extract and glycerin.

If exhaustion be present, with rapid, weak cardiac action, stimulants are indicated, either carbonate of ammonia in the form of bolus or moderate amounts of alcohol in the form of a drench. During convalescence iodide of potassium or iodide of sodium may be given, in order to diminish the tendency to organic changes in the cardiac valves.

We may add that a long rest is necessary after an attack of endocarditis, and very careful examinations of the patient are necessary at intervals, so as to discover any evidences of organic disease that may supervene.

Chronic Affections of the Cardiac Valves in the Horse.

These are of very little interest to the veterinary therapist, as, for obvious reasons, if a definite diagnosis of organic cardiac disease can be arrived at, treatment is not advisable, nor can it prove satisfactory.

We are aware that many horses suffering from organic cardiac disease are capable of performing slow work, and no doubt a large number do work of all kinds for a time without showing any marked evidences of the existence of a heart affection, and then succumb without any warning. At best, in the majority of cases in which symptoms suggestive of an organic cardiac affection are present, we can only venture to give the broad diagnosis of chronic valvular disease.

If we attempt a differential diagnosis of the various forms, we shall seldom find that the opinions given are borne out by post-mortem evidence.

The lengthy details given in some works on veterinary medicine on this subject are purely theoretical, and are of little or no clinical value.

If, as occasionally happens, we are desired to treat a case of organic cardiac disease, we find that therapeutical measures must be chiefly directed towards the symptoms present, rather than towards the actual valvular lesion that exists.

These symptoms are palpitation, dyspnœa, inability for exertion, dropsical swellings on the sternal and abdominal regions, a swollen condition of the limbs, more especially the hind extremities, attacks of vertigo, general muscular weakness, an irregular or intermittent pulse, the presence of a distinct jugular pulsation, and persistent coldness of the extremities.

Digitalis is not indicated in all stages of organic cardiac affections, and discrimination is necessary in prescribing it. The indication for this agent is when compensatory hypertrophy of the left ventricle commences to fail.

‘Digitalis has the power of restoring tone to the enfeebled cardiac muscle ; it causes a more vigorous systolic contraction of the ventricles, prolongs the period of diastole, and renders the pulse slower, stronger, and more regular. It also exerts a tonic action on the arteries, stimulating normal contraction of their muscular fibres, and so furthering a steady and continuous flow of blood onwards through the capillaries’ (Dr. Burney Yeo).

The diuretic action of this drug is also of advantage when general dropsy or swellings of the limbs are present.

It is quite clear that digitalis is not indicated during the period of compensation, neither can it be of any service when the cardiac muscle is in an advanced stage of degeneration. Rest is an absolute necessity. During the compensation period attention to the general health of the animal and to dietetics is all that is necessary.

As already remarked, it is only in exceptional instances that treatment of chronic cardiac affections is carried out, such as in the case of favourite animals, in which palliative measures may be called for to relieve distressing symptoms.

THE TREATMENT OF CARDIAC DISEASES IN THE DOG.

In the Dog cardiac diseases are regarded as not being of frequent occurrence. Post-mortem experience, however, would lead us to believe that lesions of the heart may exist without presenting symptoms suggestive of an affection of this organ during life. It is probable that in many instances the symptoms may be overlooked, or ascribed to other causes.

Palpitation is frequently met with in the dog. It may depend on dyspepsia, the presence of intestinal parasites, or on anæmic and debilitated conditions; it is also a symptom of organic cardiac affections. As already mentioned, treatment will depend on the cause of this abnormal condition. In debilitated and anæmic constitutions we find that nerve tonics give the best results.

Digitalis is seldom required, and often increases the palpitation. A combination of the citrate of quinine and iron with liquor strychnine or tincture of nux vomica may be prescribed three times daily (see formula, p. 629).

In some cases bromide of soda, combined with citrate of ammonium and iron and aromatic spirit of ammonia, gives good results (see formulæ, p. 629).

If the palpitation depends on dyspepsia, or on chronic gastric catarrh, gastric sedatives and antacids are indicated.

During paroxysms of palpitation, which are sometimes met with, diffusible stimulants may be given, such as a combination of aromatic spirit of ammonia with compound spirit of ether. A belladonna plaster may be applied over the cardiac region, taking care that the animal is not allowed to lick the part. Attention to the bowels is necessary, and also to diet.

Acute pericarditis in the dog depends on similar causes to those already mentioned for the horse—viz., rheumatism and

an existing attack of pleurisy. Treatment is to be carried out on similar lines.

In addition to the administration of sodium salicylate or salicin, if pain and distress are prominent symptoms, it is advisable to give 5 grains of Dover's powder with 1 or 2 drachms of solution of acetate of ammonium every four hours until relief is obtained.

Acute endocarditis presents no special features in the dog as compared with the horse, and similar treatment is required (for formulæ, see p. 630).

Chronic Affections of the Cardiac Valves.

In the case of favourite dogs treatment must be carried out. The differential diagnosis of these affections cannot be made with any degree of accuracy, and treatment can only be palliative.

For practical purposes it will be sufficient to consider the treatment of cases depending on (a) lesions of the mitral valve, and (b) lesions of the aortic valve. Of course, so long as compensatory hypertrophy is present, it is probable that no symptoms will be observed; and even if a diagnosis were possible at this stage, medicinal treatment is not required.

In mitral lesions, especially mitral insufficiency, when compensation fails serious consequences ensue, which to a certain extent can be alleviated by suitable treatment. Briefly, these are dilatation of the pulmonary vessels, engorgement of the lungs, imperfect aeration of the blood, respiratory dyspnœa, a disposition to congestive bronchial catarrh, cough, a feeble, laboured, and irregular action of the heart, with palpitation. The right side of the heart becomes over-distended, and the circulation in the venæ cavæ and systemic veins is hindered. The portal circulation is thus interfered with, and hepatic derangement follows. The kidneys also suffer from interference with the circulation in the renal vessels, and general dropsy finally sets in.

In aortic valvular disease, when failure of compensation

occurs, the following phenomena ensue—viz., a tendency to attacks of syncope, marked distress and palpitation on any exertion, cardiac pain, dyspnœa, and emaciation. Death may occur suddenly, and general dropsy is rare. In this affection it must be remembered that a sclerotic condition of the aortic arch and of the orifices of the coronary arteries is present.

Aortic and mitral lesions may occur together. The use of digitalis in these conditions has already been mentioned. Care must be exercised in administering this agent, so as to avoid its cumulative action in the system and also its tendency to induce gastro-intestinal irritation. It is advisable to discontinue its use for a few days during a course of treatment. In cases where digitalis disagrees with the patient, strophanthus may be given in its place.

The hypodermic injection of caffeine is advisable when symptoms of cardiac failure are present, in doses of 3 to 5 grains, repeated if necessary. Strychnine is also valuable as a general stimulant to the nervous centres.

Gastric symptoms when present depend on hepatic congestion and engorgement of the portal venous system, and will require appropriate treatment, such as a purgative followed by antacids and gastric sedatives. Digitalis must not be given in such conditions; nux vomica and sodium bicarbonate are indicated instead.

Dropsy is relieved by diuretics, such as digitalis, squill, or strophanthus, and small doses of calomel occasionally. Potassium iodide is useful in some cases, and may be combined with digitalis.

In aortic insufficiency, when compensation fails from degenerative changes in the cardiac muscle, and great dilatation of the left ventricle occurs, a very serious state of affairs is present.

One of the symptoms requiring attention is cerebral anæmia, evidenced by vertigo or syncope on any exertion. Paralysis may occur from emboli being carried to the cerebral vessels. In the earlier stages, before compensation commences to fail, an increased volume of blood is dis-

charged with force into the aorta and arterial system with each ventricular systole; this may lead to chronic inflammation and induration of the arterial coats, and dilatation of the aorta.

At this stage, both in the horse and dog, we have observed a peculiar thrill throughout the body at each cardiac contraction; this seemed to occur more particularly in the posterior aorta. Digitalis is certainly not indicated at this stage, as it simply increases the palpitation which is often so prominent a symptom. Sodium nitrite proves useful in allaying palpitation and cardiac distress in such cases. It may be given combined with sodium iodide three times daily (see formula, p. 631).

When palpitation occurs as the result of failing heart power and commencing loss of compensation in cases of aortic regurgitation, with a tendency to cerebral anæmia, tincture of digitalis, combined with aromatic spirit of ammonia and compound spirit of ether, may be given every six hours (see formula, p. 631).

Most authorities agree that digitalis is the most reliable agent in the treatment of all forms of cardiac disease in which there are evidences of failing compensation. Of course, discretion is necessary in prescribing it in order to avoid its cumulative effects; and when the pulse has been reduced in frequency by its action to a sufficient extent, the doses should be lessened.

In attacks of dyspnœa, which are common in chronic valvular affections, the administration of heroin is indicated, and often gives relief.

Opium or morphine is advised by some authorities in cases characterised by paroxysmal pain and dyspnœa, but we have found heroin far safer. It may be combined with sodium nitrite.

Degenerations of the cardiac muscle, of which fatty degeneration is the most frequently met with, do not possess much therapeutical interest, as the diagnosis of their existence is seldom made, and, even if it were possible to do so, treatment has little effect on the condition. The usual symptoms

are those common to cardiac failure, and they may appear in some instances rather suddenly. But in many cases animals dying from other diseases show on post-mortem examination fatty degeneration of the heart, although during life they did not present any symptoms which could be attributed to a cardiac affection.

From the above brief consideration of the treatment that is likely to prove palliative in organic cardiac affections, the student will gather that, when called upon to attend and treat cases of this nature, he must devote special attention to the leading symptoms that are present. At the same time he should endeavour to arrive at a diagnosis, and may test the accuracy of the diagnostic symptoms laid down in text-books by comparing those which he observes in the case with the lesions that he finds on post-mortem examinations.

A most important point, however, is to avoid a hasty diagnosis; it is far better to defer giving a definite opinion as to the existence or otherwise of a chronic cardiac affection until we are enabled from repeated examinations to confirm the diagnosis. Neglect of this precaution has resulted in cases being diagnosed as incurable, and not worth treating, which afterwards either recovered or proved of value in other hands. The great difficulty we have to contend with is that it is rarely we can obtain the previous history of a case, and besides this we have not the assistance of subjective symptoms, which prove of so much value in the diagnosis of cardiac affections in man.

The Treatment of Spasm of the Diaphragm in the Horse.

This affection is considered here because, by those who have not had an opportunity of observing a case of the kind, it has occasionally been mistaken for one of cardiac palpitation. It is characterised by a convulsive or jerking movement of the body, accompanied by a dull thumping sound, which is unconnected with the cardiac impulse, and is audible at some distance from the animal. This sound emanates in

parts posterior to the heart. In some cases we observe that the pulse is disturbed and the respirations accelerated. It may occur in hunters after a fast run, but we have also seen it in harness horses, without any appreciable cause.

In the majority of cases the administration of a diffusible stimulant and ordering complete rest causes the symptoms to disappear quickly. Two ounces of aromatic spirit of ammonia, or 2 ounces of sweet spirit of nitre, with 4 ounces of solution of acetate of ammonium, in a pint of water, may be given for this purpose, and repeated in two hours if required.

FORMULÆ.

Powders for Cardiac Palpitation occurring as a Sequel to Influenza in the Horse.

R Ferri sulph. exsicc. ...	... ̄vi.
Pulv. nucis vom. ...	... ̄ii.
Sodii bicarb. ...	... ̄iii.
Pulv. anisi ...	... ̄iii.

M. Div. in pulv. xii. Sig.: Give one twice daily in the food.

Mixture for Similar Cases when the Appetite is Deficient.

R Ferri et ammonii citratis ...	... ̄x.
Tinct. nucis vom. ...	... ̄ii.
Sodii bromidi ...	... ̄x.
Spts. ammon. aromat. ...	... ̄v.
Aquæ ...	... ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a pint of ale.

Or:

R Ferri et quininæ citratis ...	... ̄x.
Liq. strychninæ ...	... ̄v.
Spts. chloroformi ...	... ̄ii.
Acidi hydrobromici ...	... ̄x.
Aquæ ...	... ad O.i.

F. m. Sig.: Give two wineglassfuls three times daily in a pint of linseed-tea.

Mixture for Palpitation, accompanied by Anæmia, in the Dog.

R Ferri et ammonii citratis	...	...	̄ii.
Tinct. nucis vom.	...	...	̄i.
Sodii bromidi	...	...	̄ii.
Spts. ammon. aromat.	...	...	̄ss.
Syr. aurantii	...	...	̄i.ss.
Aquæ	...	...	ad ̄viii.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times daily.

Or:

R Ferri et quininæ citratis	...	...	grs. xl.
Liq. strychninæ	...	...	℥ xl.
Spts. chloroformi	...	...	̄ii.
Ac. hydrobromici	...	...	̄ii.
Syr. aurantii	...	...	̄i.ss.
Aquæ	...	...	ad ̄viii.

F. m. Sig.: Give from a teaspoonful to a tablespoonful two or three times daily.

Mixture for Palpitation depending on Gastric Catarrh in the Dog.

R Bismuthi carb.	...	...	̄ii.
Magnesii carb.	...	...	̄i.
Sodii bicarb.	...	...	̄ii.
Aq. laurocerasi	...	...	̄vi.
Aq. chloroformi	...	...	ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful twice daily.

Mixture for Acute Pericarditis in the Horse.

R Sodii salicylatis	...	...	̄x. to ̄ii.
Potassii bicarb.	...	...	̄x.
Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every three or four hours in $\frac{1}{2}$ pint of water.

Mixture for the Secondary Stages of Pericarditis in the Horse.

R Potassii iod.	...	...	̄v.
Tinct. digitalis	...	...	̄x.
Tinct. gent. co.	...	...	̄v.
Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a pint of linseed-tea.

Mixture for Acute Endocarditis in the Horse.

R	Sodii salicylatis	...	...	̄x. to ̄ii.
	Potassii bicarb.	...	...	̄ii.
	Sodii bicarb.	...	...	̄x.
	Tinct. gent. co.	...	...	̄v.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

Or:

R	Salicini	...	...	̄i.
	Quininæ sulph.	...	...	̄iii.
	Tinct. gent. co.	...	...	̄v.
	Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

Mixture for Acute Endocarditis in the Dog.

R	Sodii salicylatis	...	...	̄iii.
	Ammonii carb.	...	...	grs. xl.
	Syr. aurantii	...	...	̄i.ss.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every three or four hours.

Or:

R	Salicini	...	...	̄ss.
	Quininæ sulph.	...	...	grs. xxiv.
	Syr. aurantii	...	...	̄i.ss.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every three hours.

Hæmatinic Mixture to be given during the Progress of a Case of Acute Endocarditis in the Dog.

R	Tinct. quininæ ammoniatæ	...	...	̄vi.
	Ferri et ammonii citratis	...	...	̄ii.
	Glycerini	...	...	̄ss.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times daily.

Mixture to be given during Convalescence from Endocarditis in the Dog.

R	Potassii iod.	...	...	grs. xxxii.
	Potassii bicarb.	...	...	grs. lxxx.
	Spts. ammonii aromat.	...	...	ʒiv.
	Tinct. cinchonæ co.	...	...	ʒi.
	Syr. aurantii...	...	...	ʒi.ss.
	Aquæ	...	...	ad ʒviii.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times daily.

Mixture for the Relief of Palpitation and Cardiac Distress in Aortic Insufficiency in the Dog.

R	Sodii nitritis	...	...	grs. xxxvi.
	Sodii iod.	...	...	grs. xxxvi.
	Syr. aurantii	...	...	ʒi.ss.
	Aquæ	...	...	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful three times daily.

Mixture for Cases of Aortic Regurgitation, with Palpitation from Failing Heart Power in the Dog.

R	Tinct. digitalis	...	...	ʒii.
	Spts. ammon. aromat.	...	...	ʒvi.
	Spts. ætheris	...	...	ʒss.
	Aquæ chloroformi	...	...	ad ʒvi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful every six hours.

Cardio-vascular Stimulant and Diuretic Mixture in Chronic Valvular Cardiac Disease in the Dog.

R	Potassii acet.	...	...	ʒss.
	Tinct. digitalis	...	...	ʒii.
	Tinct. scillæ	...	...	ʒss.
	Liq. strychninæ	...	...	ʒss.
	Aquæ chloroformi	...	...	ad ʒvi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful every four hours.

Or:

R	Infusi digitalis	...	...	ʒiii.
	Potassii iod.	...	...	ʒi.
	Ammonii carb.	...	...	grs. xl.
	Syr. aurantii	...	...	ʒi.ss.
	Infusi senegæ	...	...	ad ʒvi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times a day.

Pills for Cases of Cardiac Dropsy in the Dog.

R Pulv. digitalis ... gr. ss.
 Pulv. scillæ ... gr. ss.
 Pil. hydrargyri ... gr. ss.

F. pil. i. Mitte xii. Sig.: Give from one to two pills three times daily.

Diffusible Stimulant Mixture for Chronic Valvular Disease (when required) in the Dog.

R Spts. ætheris ... ̄vi.
 Spts. ammon. aromat. ... ̄vi.
 Syr. aurantii ... ̄ss.
 Aq. camphoræ ... ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table spoonful every three hours, as required.

Tonic Mixture for Cases of Valvular Disease in the Dog.

R Tinct. digitalis ... ̄i.
 Tinct. ferri perchlorid. ... ̄ii.
 Ac. phosphor. dil. ... ̄ii.
 Syr. aurantii ... ̄ii.
 Aquæ ... ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times daily.

Or:

R Tinct. digitalis ... ̄i.
 Tinct. ferri perchlorid. ... ̄ii.
 Spts. chloroformi ... ̄ii.
 Glycerini ... ̄i. ss.
 Aquæ ... ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times a day.

Caffeine Mixture for Cardiac Dropsy in the Dog.

R Caffeinæ cit. ... grs. xvi.
 Sodii benzoatis ... grs. xvi.
 Syr. aurantii ... ̄ss.
 Aquæ ... ad ̄iv.

F. m. Sig.: Give from a teaspoonful to a tablespoonful three times a day, as required.

Powders for Cases of Valvular Disease, with Scanty Secretion of Urine in the Dog.

R Caffeinæ cit. ... grs. vi.
 Sodii salicylatis ... grs. x.

F. pulv. i. Mitte vi. Sig.: Give from half to one
 powder every four hours.

Ordinary Digitalis Mixture for Cases of Valvular Disease in the Dog.

R Tinct. digitalis ... ʒi.
 Spts. ammon. aromat. ... ʒss.
 Syr. aurantii... ... ʒi.ss.
 Aquæ camphoræ ... ad ʒvi.

F. m. Sig.: From a teaspoonful to a tablespoonful
 three times daily.

Nervine Tonic Mixture for Cardiac Valvular Disease in the Dog.

R Ferri et ammonii citratis ... ʒi.ss.
 Liq. arsenicalis ... ℥ xxxvi.
 Ammonii carb. ... grs. xxxvi.
 Tinct. nucis vom. ... ʒi.ss.
 Aquæ chloroformi ... ad ʒvi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful
 three times daily.

CHAPTER XV

THE TREATMENT OF FEBRICULA, INFLUENZA, AND STRANGLES

The Treatment of Febricula, or Simple Fever.

In the horse we frequently meet with cases in which loss of appetite, a staring coat, slightly accelerated respirations, a quickened pulse, languor and disinclination for movement, and a high temperature are the leading symptoms. The temperature may decline quickly, or the defervescence may be slow; but no disease in any organs can be observed, and the symptoms tend to disappear spontaneously.

Some authorities believe that cases of febricula may depend on the entrance into the system of some of the contagia of the specific fevers, and that by some means, the nature of which is unknown, the disease does not progress further than the febrile stage. However this may be, the therapist has to consider the treatment of this condition, irrespective of the number of theories that have been advanced in order to account for its presence.

If simple fever be neglected, and if the subjects thereof be exposed to chills or worked, serious affections of the respiratory system are likely to ensue. As the disease tends to recover of itself, if ordinary precautions with reference to hygiene and dietetics are observed, it follows that simple medicinal treatment is all that is necessary. The rigors which may be the preliminary symptom observed should be treated with diffusible stimulants, repeated as required. From 1 to 2 ounces of sweet spirit of nitre with 4 ounces of solution

of ammonium acetate in 1 pint of warm water may be given every four hours until the surface of the body becomes warm. Suitable clothing and bandages and proper surroundings are necessary.

Magnesium sulphate with potassium nitrate may be given in the drinking-water twice daily. Food should be light and easy of digestion. If the bowels do not act properly an enema of warm water should be given; this, along with the magnesium sulphate advised above, will generally have the desired effect. On no account should aloes or any active cathartic be given. The animal should not be taken out of the stable until the temperature falls to normal. There is no necessity to continue the diffusible stimulants when the surface of the body becomes warm. In fact, the less medicines in the fluid form that are given the better.

In the absence of rigors and coldness of the surface of the body and extremities, we give no medicines beyond the salines in the drinking-water, and find that these cases progress favourably. There is no necessity for the formidable list of medicinal agents that are mentioned by some authors for the treatment of this simple affection.

In the dog we also meet with cases of simple fever. If the temperature runs high, we prescribe small doses of quinine and phenacetin, repeated every three hours. Mild aperients, such as extract of cascara or syrup of buckthorn, may be given if the bowels are confined. The food should be light, and the animal should be placed in a warm kennel. If rigors be present, a few doses of sweet spirit of nitre with solution of ammonium acetate are indicated.

The Treatment of Influenza.

Influenza being a disease that may occur in a variety of forms, it follows that its treatment will depend on the organs of the body that are affected. The sequelæ of this disease are of importance and demand attention. Influenza is now recognised as a microbic affection, and this knowledge proves of importance from a therapeutical point of view.

In common with many other diseases, the views held with

regard to its treatment have been considerably modified in recent years, this modification chiefly consisting in the adoption of simpler and more rational therapeutical measures.

In the *catarrhal* or uncomplicated form simple treatment will usually prove successful. Proper hygienic surroundings, suitable clothing, good food, and careful nursing are of first importance. If, as often occurs, the primary symptoms presented are severe rigors, the administration of diffusible stimulants is indicated. Spts. æth. nit. ʒii. , with liq. ammonii acetatis ʒiv. in water, may be given every three or four hours until the shivering fit has passed off, and the surface of the body and extremities become of a normal warmth. Magnesium sulphate with potassium nitrate should be given in the drinking-water, and a plentiful supply of the latter should always be within reach of the patient.

Catarrh of the nasal passages and of the pharynx or larynx is best treated with inhalations of steam medicated with oil of eucalyptus. If there be much difficulty in swallowing and a distressing cough, an electuary containing belladonna, potassium chlorate, and honey should be prescribed. If acute laryngitis be a complication, the application of a cantharides blister to the region of the throat will give relief, and the other details in the treatment of this condition may be carried out (see p. 579).

The *thoracic* form of influenza, in which either bronchitis, pneumonia, or pleuro-pneumonia is present, should be treated in a similar manner to that already mentioned for these affections (see p. 570).

The *abdominal* form is complicated by catarrh of the stomach and intestines or by enteritis. Pneumonia may either precede or follow these conditions. Anodynes must be given to relieve the painful symptoms, a combination of opiates with chloral hydrate being preferable. These cases in our experience usually prove fatal.

The *rheumatic* form usually occurs as a sequel to the catarrhal or pulmonary form of influenza, or it may appear in the earlier stages. It is evidenced by pain in the limbs, difficulty in movement, and a tendency to inflammation of

the fibrous and fibro-serous structures of joints, tendons, and muscles. In some cases these complications do not occur until convalescence is proceeding. The sesamoid bursæ frequently become affected, the pain and lameness being very acute, and arising suddenly. Cardiac complications are apt to ensue in this form of the disease.

The drug which appears to give the best results in the treatment of the rheumatic form is sodium salicylate. It lowers the temperature, acts as an analgesic, and has the power of neutralising, not only the rheumatic poison, but it also is believed to inhibit the action of the influenza microbe. It may be given in doses of from 2 to 4 drachms every four hours, either in the form of solution or as a bolus.

Sodium bicarbonate should also be given freely in the drinking-water. The affected structures should be fomented with hot water, belladonna liniment then applied, and the part covered with cotton-wool and a bandage. When acute inflammation has disappeared and swelling of the affected part remains, with lameness, the application of a cantharides blister is necessary.

Renal and hepatic complications of influenza may manifest themselves. Parenchymatous nephritis may occur. This either passes off or assumes the chronic form. The treatment is similar to that already mentioned under 'Renal Affections' (see p. 512).

The hepatic complications may consist of a congested condition of the liver; or, according to the late Professor Williams, the yellow coloration of the mucous membranes that occurs depends on tumefaction of the lining membrane of the bile-ducts, which prevents the free flow of bile into the duodenum, hence it becomes absorbed.

Acidity of the stomach is associated with this condition, evidenced by the animal licking the walls, grinding the teeth, and by the presence of slight salivation. The suitable treatment is to administer sodium sulphate combined with sodium bicarbonate in the drinking-water.

After recovery from an attack of influenza, cardiac irregularity and palpitation may occur as a sequel, depending on

cardiac asthenia. To overcome this condition, we prescribe a combination of *nux vomica*, carbonate of iron, and quinine. If this is refused in the food it should be given in the form of bolus.

Digitalis is seldom required ; indeed, in the majority of such cases it appears to do harm. The judicious administration of arsenic may be tried if the above treatment does not appear to succeed. Careful dieting is necessary throughout the treatment of an attack of influenza, and during convalescence care must be taken to avoid an excess of nitrogenous food, otherwise digestive and renal complications may ensue.

Exercise should be ordered with discretion, and not until all febrile symptoms have disappeared and the animal's constitution becomes sufficiently strong. Many cases suffer a serious relapse from being taken out of the stable too soon, and fatal results may ensue if the animal is put to work before being fit. Influenza being an infectious disease, measures for isolation should be carried out.

From the above brief consideration of influenza, the student will gather that it is impossible to lay down dogmatic rules for its treatment. The type of the disease varies in different years, and it is only by a careful observation and examination of the cases that rational treatment can be prescribed. Above all things 'drugging' should be avoided, and we may also remark that the less fluid medicines administered in the form of drenches the better. If stimulants are indicated, we find that carbonate of ammonia in the form of bolus repeated at intervals is safe and effectual. The drawback is that it is not always possible to get this form of medication carried out in a satisfactory manner.

In some epidemics of influenza a very high temperature is a leading symptom, and requires attention. The best antipyretic agent in our experience is quinine. It may be given in the form of bolus, or administered in a semi-solid form by means of a 'medicine-gun.' In cases where swallowing is painful and difficult we give it in the form of electuary.

It must be remembered as a clinical fact, however, that in

some instances the temperature is not always a reliable guide as regards the gravity of the case. Some cases with a high temperature progress in a favourable manner, while others with a temperature of 102° or 103° may show evidences of serious complications.

A relapse, manifested by the temperature having fallen to normal in the usual time, and then suddenly reascending, is always a serious symptom, and usually indicates that a secondary infection has taken place, or that a complication has occurred.

The pulse, the condition of the heart and respiratory organs, the appetite, and the general appearance of the animal have to be taken into consideration in judging of the progress of a case and the indications for treatment.

Active cathartics are contra-indicated in all forms of influenza. Many cases succumb by reason of the owner or attendant having given an aloetic ball at the commencement of the affection, the result being that the animal's system is weakened to such an extent that all treatment fails to maintain his strength. With reference to the employment of counter-irritants in the pulmonary form of influenza, similar remarks to those already made in connection with respiratory diseases will apply (see p. 575).

A very serious complication of the thoracic form of influenza which may occur, especially in the case of heavy cart-stallions in high condition, is acute laminitis. This will require appropriate treatment, for information on which the student is referred to works on veterinary surgery. Such cases are frequently fatal.

Another sequel or complication is purpura hæmorrhagica. This will receive consideration in Chapter XVI. (p. 646).

The Treatment of Epizoötic Cellulitis, or 'Pink-Eye.'

This is a form of influenza characterised by high fever, swelling of the eyelids, a pink or bright-red colour of the conjunctivæ, lachrymation, pain and swelling in the limbs the result of infiltration of the cellular tissue, constipation, and in some cases interference with the biliary secretion.

From a therapeutical point of view this form presents certain peculiarities which are of importance. These are, first, the existence of an excess of the fibrin-forming materials in the blood and a tendency to the formation of thrombi. This peculiar condition of the blood may cause a fatal termination in cases that appear to be progressing favourably, the autopsy revealing the presence of thrombi in the heart. In some instances, even after the animal has been sent to work, fatal results have occurred from plugging of the hepatic and cerebral arteries.

Occasionally lesions of the cardiac valves result as a complication, and this further contributes to the formation of thrombi.

In the next place, enteritis may ensue during the progress of a case, and cause a fatal termination.

Although pulmonary complications are less frequently met with in this form of influenza than in the ordinary types, still in certain epidemics of the disease pulmonary engorgement causes fatal results, especially if the cases have been neglected.

In ordinary cases simple treatment is all that is required. We have treated a large number simply with the administration of magnesium sulphate and potassium nitrate in the drinking-water, and attention to diet and surroundings, etc. Occasionally diarrhœa is observed in the early stages, and this, unless excessive, should not be checked, as it tends to cease spontaneously, and appears to benefit the animal.

Although the temperature may be high, it tends to decline spontaneously, and antipyretics are seldom required in uncomplicated cases. If the bowels are confined, enemata of warm water should be given, and we can usually get the animal to take sufficient magnesium sulphate in the food or drinking-water to act as a laxative and produce desired effects. The nitrate of potassium exerts a beneficial action on the blood, and prevents the tendency to the formation of thrombi.

We do not consider that it is either safe or necessary to administer the moderate dose of aloes that is advised by some authors in the treatment of this affection in the early stages,

as there is a danger of superpurgation occurring; besides, if the purgative fails to act, nausea will result, and appetite will be seriously interfered with. Purgatives of any kind should be avoided in all stages of the disease.

If at any time there is a tendency to a feebleness of the pulse and general weakness, full doses of ammonium carbonate are indicated, and should be given in the form of bolus. This agent is not only a valuable stimulant, but it also tends to prevent the formation of thrombi by its effect on the blood.

Cardiac weakness is an important factor in the formation of thrombi, hence the necessity for the prompt administration of stimulants when the occasion arises. Chlorate of potash is contra-indicated in this affection, as it increases the coagulating power of the blood.

If the ordinary attendant is unable to administer medicines in the form of bolus, it is advisable to employ one who is skilled in this respect. The most advisable method is to dispense the ammonium carbonate in gelatine capsules, and it should be freshly powdered as required. According to the indications of the case, from 2 to 4 drachms may be given four times daily. If pulmonary complications arise, quinine may be added to the ammonium carbonate with advantage.

A guarded prognosis should always be given in this form of influenza, and a very careful examination of the patient should be made daily, so as to detect the occurrence of unfavourable symptoms. Abdominal complications are always serious and frequently fatal. Beyond the administration of anodynes little can be done in the way of treatment.

Ophthalmic phenomena have been observed in some cases, consisting of iritis, with purulent effusion into the anterior chamber. Occasionally cloudiness or opacity of the cornea is present. These will require appropriate treatment, for the details of which the student is referred to works on veterinary surgery. We may remark that the internal administration of potassium iodide gives good results in such cases. During convalescence from 'pink-eye' the iodide of potassium with carbonate of iron and nux vomica are useful, the first of these agents assisting in the removal of any swelling of the

limbs that may remain, and the others acting as tonics to the system.

In some outbreaks of influenza the presence of suppurative foci in the submaxillary and retropharyngeal lymphatic glands, and occasionally in the glands in other regions, would suggest that these cases were complicated with the presence of strangles streptococci.

The Treatment of Strangles.

In the regular or benignant form of strangles, characterised by the formation of one or more abscesses in the connective tissue associated with the gland structures between the branches of the lower jaw, the treatment required is usually simple. Saline febrifuges should be given in the drinking-water, such as magnesium sulphate with potassium nitrate.

The pharyngitis that is usually present is best treated with inhalations of steam medicated with oil of eucalyptus, and a stimulating liniment should be applied to the region of the throat. When the intermaxillary abscess is slow in 'pointing' a mild cantharides blister should be applied, and the action of this may be assisted by poulticing with linseed-meal, or by applying, what is far cleaner and more efficacious, a thick layer of thermofuge (see p. 88). When the abscess 'points'—that is, fluctuates on pressure—it should be carefully opened, the contents cleared out, the cavity thoroughly irrigated with an antiseptic solution and packed with antiseptic gauze. This dressing may be repeated twice daily.

In more severe cases, when acute laryngitis complicates the pharyngitis, and there is difficulty in swallowing, fluids being returned by the nostrils, a distressing cough present, and a loud noise produced during inspiration, a smart cantharides blister should be applied to the region of the throat. This often gives speedy relief, and is far preferable to fomentations or poultices. An electuary, containing belladonna, chlorate of potash, honey, and glycerin, should be given three or four times daily, by placing it on the back of the tongue and between the molar teeth; this relieves the

difficulty in swallowing, and allays irritability of the larynx. Medicated inhalations should be diligently carried out.

If the difficulty in breathing is excessive and distressing, tracheotomy should be performed without delay. For details of this operation the student is referred to works on veterinary surgery. In a country practice this operation has often to be performed in an emergency, and in the absence of a tracheotomy-tube the trachea may be opened, and an improvised tube made use of until a surgical one can be obtained.

In order to judge when it is safe to remove the tube, its opening should be covered with the hand and the effect on the respirations noted.

In irregular forms of strangles the abscesses may form in various parts of the parotid region, and also about the head and face. In opening these care is often necessary in order to avoid injuring important structures. The superficial part should be incised with the knife; the cavity of the abscess can then usually be reached with the finger and safely opened.

In irregular or malignant strangles abscesses may form in connection with the lymphatics in various regions of the body, such as in the mesenteric, bronchial, axillary, and inguinal glands. Purulent inflammation may also occur in the parenchyma of various organs, and a condition of pyæmia result. The occurrence of suppurative foci in regions beyond surgical interference usually proves fatal.

The administration of internal antiseptics, such as quinine and potassium chlorate, is advised, and carbolic acid or cyllin may also be tried.

As strangles is now believed to depend on the presence of a special streptococcus, the injection of an antistreptococcic serum has been tried; but the results obtained have up to the present been very doubtful (see p. 400). The disease being an infectious one, measures for isolation should be carried out. Good surroundings, attention to diet, and careful nursing are of great importance in the treatment of strangles.

The patient's appetite should be tempted by food of all

kinds, as if he refuses to feed there is great danger and difficulty in forcing nourishment on him. In fact, the administration of drenches is impossible in many cases in consequence of the presence of laryngitis. Milk forms an excellent food if the animal can be persuaded to take it. When pulmonary complications occur with strangles the termination is very often fatal.

We have already drawn attention to the fact that abscesses simulating those of strangles may occur in connection with an attack of influenza, and these are believed to depend on infection with the strangles streptococcus. In our experience it is a very serious complication, and is especially prevalent during some epidemics of influenza.

FORMULÆ.

Febrifuge Mixture for the Primary Stage of Influenza in the Horse.

R Spts. æth. nit.	...	...	℥v.
Liq. ammonii acet.	...	...	℥x.
Aquæ ...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours in $\frac{1}{2}$ pint of warm water until the rigors disappear.

Fever Powders for Influenza.

R Magnesii sulph.	...	...	℥xii.
Potassii nit.	...	...	℥ii.

M. Div. in pulv. vi. Sig.: Give one twice a day in the drinking-water.

Electuary for Cases of Influenza complicated with Laryngitis.

R Ext. belladonnæ vir.	...	...	℥i.
Potassii chlorat.	...	...	℥ii.
Ac. borici	...	...	℥i.
Glycerini	...	...	℥ii.
Mellis ...	...	...	ad ℥viii.

F. elect. Sig.: Give two tablespoonfuls on the back of the tongue three or four times daily.

Stimulant and Antipyretic Balls for Influenza.

R Quininæ sulph.	...	...	℥vi.
Ammonii carb.	...	...	℥ii.
Ext. gentianæ	...	...	q.s.

M. Div. in bol. vi. Sig.: Give one three times daily.

For Cardiac Irregularity and Palpitation after Influenza.

R	Ferri carb. sacch.	...	...	̄iv.
	Quininæ sulph.	...	...	̄ss.
	Pulv. nucis vom.	...	...	grs. xx.
	Ext. gentianæ	...	...	q.s.

M. F. bol. i. Mitte xii. Sig.: Give one three times a day.

Or:

R	Ferri carb. sacch.	...	...	̄iii.
	Pulv. nucis vom.	...	...	̄ii.
	Potassii bromid.	...	...	̄i.ss.
	Pulv. anisi	...	...	̄iii.

M. Div. in pulv. vi. Sig.: Give one twice a day in the food.

Powders to be given during Convalescence from 'Pink-Eye.'

R	Potassii iod.	...	...	̄i.ss.
	Ferri carb. sacch.	...	...	̄vi.
	Pulv. nucis vom.	...	...	̄ii.
	Pulv. anisi	...	...	̄iii.

M. Div. in pulv. xii. Sig.: Give one twice a day in the food.

CHAPTER XVI

TREATMENT OF PURPURA HÆMORRHAGICA, LYMPHANGITIS, AND RHEUMATISM

The Treatment of Purpura Hæmorrhagica.

MANY authorities in the present day believe that the above disease depends on the presence of a streptococcus, and that it always arises as a sequel to affections such as influenza or strangles.

The injection of a polyvalent antistreptococcic serum in the earliest stage of the disease is said to cut short or cure an attack, but further clinical evidence is necessary on this point.

The late Professor Nocard advised the polyvalent anti-streptococcic serum of Marmorek, and M. Rohr recommends 10 c.c. of this serum, three times daily for the first two days and 10 c.c. twice daily for two or three days following (see p. 400).

The influence of badly-drained and ill-ventilated stables in the production of this disease is well known, hence in its treatment hygienic measures are of the greatest importance.

Most authorities agree that in purpura grave alterations occur in the blood. These are stated to be 'an excess of water, a deficiency of albumin and fibrin factors, or a condition in which the albumin and fibrin producing materials are in an undue state of solution; or a number of the red corpuscles become altered, shrivelled up, or destroyed; the hæmoglobin is dissolved in the serum, and the coagulating power of the blood is interfered with' (Robertson, 'Equine Medicine').

The results are the appearance of petechiæ or ecchymoses on the visible mucous membranes, the formation of swellings in different parts of the body, and the tendency to blood extravasation or effusion into vital organs and hæmorrhage into the intestinal canal.

Some authorities state that alterations in the walls of the bloodvessels are present in addition to the changes in the blood.

The medicinal agents that have given the best results in the treatment of purpura are potassium chlorate and oil of turpentine. The former can be given in the food or drinking-water. It may be administered in fairly large doses for the first few days, such as from 2 to 3 drachms three times daily; these should then be reduced to 2 drachms twice daily.

Care should be taken to avoid too large doses, as otherwise gastro-intestinal irritation will be produced. This agent is believed to exert a special action on the blood (see p. 99).

The oil of turpentine may be given in doses of 6 to 10 drachms three times daily, well diluted, in the form of an emulsion with olive-oil, and combined with raw eggs and milk. When the case shows signs of improvement the doses should be lessened, or the drug may be discontinued.

The tincture of iron is advised by some practitioners, and may be combined with the turpentine mixture.

The great difficulty in the treatment of purpura is experienced when the region of the throat becomes much swollen, and deglutition is interfered with. Pharyngitis may complicate the affection, and still further prevent the taking of sufficient food and the administration of medicines. In such instances the iodide of potassium may be administered in the form of bolus; the latter, if well anointed with vaseline and carefully administered, is usually swallowed without much difficulty.

The potassium iodide may be combined with quinine and prescribed three times daily.

The exact manner in which the iodide acts in this disease is not understood; it probably exerts some inhibiting effect on the streptococci, and some antiseptic action on the blood.

In cases where the administration of medicines is difficult or impossible, the intratracheal injection of a solution of iodine and potassium iodide was advised by Dieckerhoff. The solution recommended is as follows: Iodine, 1 part; potassium iodide, 5 parts; distilled water, 100 to 200 parts. Of this solution from 5 to 7 drachms were injected into the trachea once daily. Some authorities prefer the weaker solution, and inject only 45 to 75 minims twice daily.

This method of treatment cannot be advised, as the results have not proved satisfactory in many cases, and instances of inflammation of the trachea, bronchitis, and pulmonary gangrene are reported after the employment of these injections.

Subcutaneous injections of normal saline solution are well worthy of a trial in the treatment of these cases (see p. 103).

Intravenous injections of tallianine (terpene ozone) are favourably reported on by American and Continental practitioners.

The intravenous injection of argentum colloidal, also known as collargol or colloid silver, is advised by Continental authorities, in doses of 50 grammes ($1\frac{2}{3}$ ounces) of a 1 per cent. solution, at intervals of two hours.

In cases characterised by marked debility and a feeble pulse, the subcutaneous or intravenous injection of a solution of adrenalin chloride may be tried. This not only raises the general blood-pressure, but also, by causing constriction of the vessels, it may lessen the tendency to extravasation and internal hæmorrhage.

As the action of this agent is very transient, repeated doses would be necessary.

Ergotin has been tried, but with doubtful results.

When, from extensive swelling of the throat or nostrils, marked dyspnœa is present, tracheotomy must be performed. This ought to be carried out sufficiently early, as it is of great importance that the animal should breathe as freely as possible, in order that a due amount of oxygen may reach the blood.

Strict attention to aseptic precautions is necessary in carrying out this operation, and also in the after-treatment.

Agents that have a tendency to interfere with the coagulating power of the blood should be avoided in purpura, such as preparations of ammonia, potassium nitrate, etc.

Local or external treatment will be necessary in severe cases.

When the head and nostrils are much swollen, it is a disputed point as to whether hot or cold applications are preferable. Some authors advise cold sponging with weak astringent solutions, such as those of lead acetate, aluminium acetate, etc. These are said to be especially useful in hot weather. Mr. H. Gray, M.R.C.V.S., recommends the application of 1 part oil of turpentine with 3 parts of linseed-oil two or three times daily. In cold weather hot applications are preferred.

We have seen good results from medicated inhalations of steam in these cases, the agent employed being turpentine or terebene. Of course, care must be taken that the nostrils, etc., do not become irritated by the process, and that plenty of air be allowed.

We have not observed any benefit from either hot or cold applications to the swellings in other parts of the body. These swellings are usually of a metastatic character, and as they depend on a morbid condition of the blood, they are but slightly affected by local treatment.

The question of puncturing or scarifying the swellings is one on which difference of opinion exists.

The danger of septic infection and sloughing occurring, even with aseptic precautions, must be remembered; hence, incisions and drainage cannot be recommended.

This procedure, however, becomes necessary when extensive swelling of the prepuce or sheath is present, or when paraphymosis occurs.

An important clinical fact to be remembered is that a sudden diminution of the external swellings may be followed by colicky pains and death in a short space of time from

hæmorrhage into the intestines. Various other complications may cause a fatal termination, so that in every case a guarded prognosis must be given.

It is important that the presence of purpura should be detected as early as possible, as treatment is then more likely to prove successful. Hence, during the course of strangles, influenza, etc., the mucous membrane of the nostrils should be carefully examined for the presence of the characteristic petechial spots, of a dark red or purplish hue.

Swelling of the nostrils and lips is often the first symptom observed in some cases; in others the primary manifestation may be pain in one or more limbs, with slight cedema, followed by the characteristic swellings, which terminate abruptly, as if a ligature had been applied around the parts. In others, again, the presence of a papular eruption on the skin may be the first indication of the appearance of purpura.

Good nursing, attention to diet, and to the sanitary condition of the surroundings are details of the highest importance in connection with the treatment of this disease.

Milk is one of the best forms of food, and the patient should be allowed as much of it as he will take.

If the appetite fails completely we have a very serious case to deal with, as when it becomes necessary to administer nourishment in the form of milk, eggs, and stimulants, the animal becomes distressed, fights against the process of drenching, and there is a danger that some of the fluids may enter the bronchial tubes, more especially when deglutition is difficult.

If pharyngitis be a prominent symptom, an electuary of belladonna, chlorate of potash, and honey may be given three times daily.

The term scarlatina is applied by some authors to what would appear to be a form of purpura specially characterised by the presence of pharyngitis and suppuration in various parts of the body, but especially in the submaxillary glands.

As no special treatment is required beyond that already mentioned for purpura, there is no necessity to discuss the

question of a differential diagnosis here. We may remark, however, that even admitting the affection to be distinct from purpura, it bears no resemblance whatever to the disease known as scarlatina in the human subject, and the term is therefore misapplied.

The Treatment of Lymphangitis.

This is also known as inflammatory œdema, and in popular language as 'weed.' It consists of an inflammation of the lymphatic vessels and glands, of one hind-limb usually, and occurs after a period of idleness, during which the animal is fed as usual. Heavy cart-horses are most subject to this affection.

The common clinical history is that the animal is found in the morning with one hind-limb very much swollen; great tenderness in the region of the inguinal glands is present, the latter being much swollen. Pressure on this region causes acute pain; marked abduction of the limb, great lameness, and constitutional disturbance are also present, with a moderate degree of fever, which is of a sthenic character, unless the affection occurs in a debilitated animal.

In cases where we have the opportunity of seeing the affection in the very early stages, the first symptoms presented are marked rigors, without any local manifestation. These rigors are followed by a hot stage, and when swelling of the limb occurs pain is lessened.

The pathology of this disease is not thoroughly understood. According to some authorities, the lymphatic glands become irritated by chyle rich in nutritive products; the affection is believed to commence in the mesenteric glands, and to spread to those in the inguinal region.

Alterations in the character of the blood are stated to occur, such as an increase in the fibrin-forming elements.

The swelling of the limb is due to extravasation of the material resulting from inflammation of the lymphatic glands and lymph vessels into the surrounding connective tissue.

If, during recovery from an attack, this exudate, instead of being absorbed, becomes organised, a chronic thickening

of the limb results, and after repeated severe attacks a condition termed elephantiasis occurs, which resists every form of treatment.

Lymphangitis may also occur from wounds or injuries to any part of a limb, and especially from the entrance of septic infection, even from a very minute abrasion. A cracked or greasy heel may be the starting-point of the disease. It has been suggested by some authorities that all forms of lymphangitis result from septic infection—*e.g.*, from an abrasion which may have been overlooked—but with this we cannot agree.

The premonitory symptoms of what we might term a constitutional attack—*viz.*, marked rigors, fever, quickened pulse, accelerated respirations, which occur prior to any local symptoms, and the fact of the inguinal glands becoming affected before those situated lower down in the limb, also the suddenness of the attack—hardly point to local septic infection as the sole cause of this affection. In some cases, but more rarely, a fore-limb is affected instead of a hind one, and instances are met with in which the symptoms vary as regards severity.

The above brief description will enable us to consider the indications for treatment in this affection. In the early stages—*viz.*, when rigors are present—the animal should be warmly clothed, and a few doses of sweet spirit of nitre with solution of acetate of ammonia may be given at intervals until the shivering fit is past. In the case of very plethoric animals, we find that aconite combined with the above proves useful, but it should be prescribed with discretion. If at this stage lameness is present and swelling of the inguinal glands, hot water should be diligently applied to this region, and a liniment composed of belladonna and glycerin rubbed gently in. The limb should then be enveloped in cotton-wool as high up as possible, and a bandage carefully applied. After the shivering stage has passed off, the question of administering a cathartic must be considered.

Some practitioners advise an aloetic purgative at this

stage; others depend on milder agents, such as raw linseed-oil, and the administration of either sulphate of magnesia or sulphate of soda in the drinking-water. In plethoric cases we find it advisable to administer a moderate dose of aloes with calomel, but in cases characterised by debility the milder measures are far preferable.

There is no doubt with reference to the beneficial effect of a purgative in reducing the pain and swelling in the limb. After the action of the cathartic has passed off, magnesium sulphate with potassium nitrate should be given twice daily in the drinking-water.

The affected limb should be well fomented three or four times daily, and the belladonna liniment, already mentioned, applied afterwards. Gentle massage is beneficial, followed by the careful application of wool and a bandage as high up as possible on the limb. When the acute symptoms in the limb have subsided, gentle walking exercise should be given; and in order to assist absorption of the exudate the iodide of potassium should be administered three times daily in doses of a drachm; or the biniodide of mercury in doses of 5 grains three times daily may be substituted for the above (see p. 139).

In chronic cases, beyond a long course of potassium iodide or biniodide of mercury, but little can be done. The application of an ointment, composed of 1 part potassium iodide to 8 parts of lanolin, to the swollen limb once or twice daily appears in some cases to stimulate absorption of the exudate.

In the condition known as elephantiasis, treatment of any kind proves useless, and counter-irritation is of no value.

Disseminated abscesses may appear on the inside of the limb during the course of an attack of lymphangitis, and this occurrence is always a serious complication, especially when involving the sheaths of tendons. The formation of ulcerated surfaces is the result, and blemishes are often left. This condition must be treated with antiseptic agents, and when healing is progressing the judicious employment of caustics may be indicated in order to suppress exuberant

granulations. Arsenic in combination with potassium iodide should be administered in such cases.

In connection with these abscesses, it is of importance to distinguish this condition from that affection termed 'epizoötic lymphangitis'; hence a microscopical examination of the pus becomes necessary in doubtful cases.

As cases of lymphangitis are very apt to recur, preventive treatment is necessary. If an animal subject to this affection is left idle, high feeding should be avoided and magnesium sulphate may be administered in the drinking-water, in order to act on the bowels and kidneys and promote elimination. In some of these cases even one day's idleness—*e.g.*, the usual rest on Sunday—may predispose to an attack unless precautions are adopted with reference to lessening the amount of oats allowed.

During the treatment of lymphangitis soft diet should be prescribed, and a moderate amount of green food when it can be obtained.

During convalescence, if the weather suits, it is advisable to send the animal on grass, especially if the case does not appear to progress favourably.

When the kidneys do not act sufficiently, we find that colchicum is a very useful agent; it may be combined with the potassium iodide.

In cases accompanied by debility preparations of iron will be indicated. Small doses of sulphate of iron combined with arsenic may be given twice daily.

The Treatment of Acute Rheumatism.

This affection is also termed 'rheumatic fever.' It is by no means frequently met with in veterinary practice. Its special characteristics are hyperpyrexia, a special tendency to inflammation of certain structures, such as the coverings of muscles, tendons, and joints, and in many instances the endocardium and the pericardium become involved. Usually the synovial membranes of certain joints become affected by inflammatory hyperæmia, with effusion of fluid into the joint,

but no organic changes occur; and a characteristic feature of the disease is that the inflammation rapidly subsides in one joint or set of joints and attacks others. The lameness is severe, and the affected parts swollen and painful. The joints usually affected in the horse are the stifle, fetlock, and knee, less frequently the hock. Suppuration is very seldom met with.

The true nature of acute rheumatism is not known, although various theories have been suggested.

In the treatment of this affection, the salicylate of sodium gives good results. Full doses of alkalies are also indicated.

Some practitioners recommend an aloetic purgative at the commencement of treatment; others advise full doses of magnesium sulphate or sodium sulphate.

When a high degree of fever is present, we do not consider it prudent to give aloes, but prefer a dose of raw linseed-oil, followed up with magnesium sulphate in the drinking-water. When the bowels have been sufficiently acted on, we give, instead of the magnesium sulphate, either bicarbonate of potash or bicarbonate of soda in full doses, combined with nitrate of potash, twice daily. The action of alkalies in this affection is not thoroughly understood; they are supposed to exert some special effect on the morbid condition of the blood that is present.

The sodium salicylate should be given in doses of $\frac{1}{2}$ ounce every three or four hours; if it is taken in the food so much the better, otherwise it should be administered in the form of drench. It reduces the temperature and relieves the pain; whether it exerts any special effect in preventing the occurrence of cardiac lesions is a doubtful matter.

When symptoms of endocarditis present themselves, treatment should be carried out as already mentioned (p. 620).

The tendons immediately below the knee or hock, the sesamoid bursæ, the thecæ of the muscles of the loins and quarters, or of the thoracic region may be involved. The pleuræ may be affected in some cases. Local treatment should be directed to reduce pain and inflammation in the affected parts. When the limbs are affected, fomenting

with hot water, and then applying a liniment composed of belladonna, laudanum, and bicarbonate of soda, gives good results. The parts should then be covered with cotton-wool and a bandage applied. Of course, in some regions the latter cannot be carried out. When the acute symptoms have disappeared a stimulating liniment should be applied. If the disease appears to be located in one joint, it is advisable to apply a cantharides blister.

During convalescence the iodide of potassium may be given, and if the kidneys do not act properly, colchicum may be combined with it.

In the *chronic* form of rheumatism, which may be either muscular or articular, the drugs that appear to produce the best results are potassium iodide and alkalies. This type of the disease may appear in various forms; it may cause obscure lameness; it may affect the muscles of one side of the neck or the thoracic muscles, or the muscles of the loins.

A special peculiarity of rheumatism is its tendency to recur, especially in damp weather. If the disease is localised in any region blisters should be applied.

Hygienic surroundings and avoidance of cold or damp are essentials in the treatment of all forms of rheumatism.

In the dog rheumatism is met with in similar forms to those mentioned, and treatment is carried out on the same general lines.

Blisters, however, are not advisable in the dog, and we must rely on stimulating liniments instead. In chronic cases affecting the joints liniment of iodine may be applied.

It is believed by some authorities that many so-called cases of rheumatism in the dog in reality depend on a form of pachymeningitis (see p. 563). Thus, cases regarded as lumbago—*i.e.*, rheumatism affecting the muscles of the loins, also rheumatism affecting the abdominal muscles and the cervical muscles—often depend on an affection of the nerves supplying these structures.

Whether the rheumatic poison is capable of acting on the spinal cord or on the spinal nerves is doubtful. The recurring nature of these attacks and their metastatic

character, together with the beneficial influence which the salicylates exert thereon, would suggest a rheumatic origin at least in some cases.

Mixture for Purpura Hæmorrhagica.

R Ol. terebinth. ʒv.
Tinct. ferri perchlorid. ʒx.
Potassii carb. ʒss.
Ol. olivæ ʒx.
Aquæ ad O.i.

F. m. Sig.: Give two wineglassfuls three times daily with a pint of milk and four raw eggs.

Powders for Same.

R Potassii chlorat. ʒiii.

Div. in pulv. xii. Sig.: Give one twice daily in the drinking-water.

For Purpura Hæmorrhagica when Fluid Medicines cannot be administered.

R Potassii iod. ʒi ss.
Quininæ sulph. ʒi.ss.
Ext. gentianæ q.s.

F. bol. i. Mitte vi. Sig.: Give one three times daily.

Mixture for the Early Stages of Lymphangitis.

R Tinct. aconiti (B.P.)... .. ʒii.ss.
Spts. æth. nit. ʒvi.
Liq. ammon. acet. ʒxii.
Aquæ ad O.i.

F. m. Sig.: Give two wineglassfuls every three hours in a pint of warm water until the rigors disappear.

Liniment for Lymphangitis.

R Ext. belladonnæ vir. ʒi.
Tinct. arnicæ ʒiv.
Glycerini ʒvi.
Liq. plumbi subacet. ʒxii.
Aquæ ad. O.ii.

M. F. lin. Sig.: Apply to the affected limb three times daily after fomenting.

Mixture for Promoting Removal of the Resulting Exudate in Lymphangitis.

R Hydrarg. biniod. ʒi.
 Potassii iod. ʒi.
 Aquæ ad ʒxii.

F. m. Sig.: Give half a wineglassful in the food three times daily.

Powders for Lymphangitis in the Secondary Stages of Debilitated Cases.

R Ferri sulph. exsicc. ʒi.ss.
 Acidi arseniosi ʒi.
 Potassii iod. ʒi.ss.
 Pulv. anisi ʒiii.

M. Div. in pulv. xii. Sig.: Give one twice a day in the food.

Powders for Rheumatism in the Horse (Secondary Stages).

R Potassii iod. ʒi.ss.
 Pulv. colchici ʒvi.
 Potassii bicarb. ʒiii.
 Pulv. anisi ʒiii.

M. Div. in pulv. xii. Sig.: Give one twice a day in the food.

Lotion for Painful Joints in Rheumatism.

R Tinct. opii ʒiii.
 Potassii carb. ʒvi.
 Glycerini ʒiii.
 Aquæ ad O.i.

F. lotio. Sig.: Apply three times daily by means of lint.

Mixture for Subacute and Chronic Rheumatism in the Dog.

R Potassii iod. ʒii.
 Sodii salicylatis ʒi.
 Syr. aurantii ʒi.
 Aq. menthæ pip. ad ʒvi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful two or three times daily.

For Chronic Rheumatism in the Dog.

R Pulv. guaiaci resinæ ʒi.
 Potassii iod. ʒi.
 Tinct. colchici ʒiii.
 Syr. aurantii ʒii.
 Aq. menthæ pip. ad ʒvi.

F. m. Sig.: Give from a teaspoonful to a dessertspoonful twice daily.

Liniment for Applying to the Affected Joints in Rheumatism in the Dog.

R	Tinct. opii	...	...	...	℥ss.
	Ol. pini sylvestris	...	...	...	℥ss.
	Tinct. iodi	...	...	...	℥ss.
	Lin. saponis	...	...	...	ad ℥iv.

F. lin. Sig. : Apply twice daily to the joints with gentle friction, after bathing with hot water.

Or :

R	Tinct. arnicæ...	...	...	...	℥ii.
	Spts. camphoræ	...	...	...	℥ii.
	Liq. ammon. fort.	...	...	...	℥ss.
	Saponis mollis	...	...	...	℥ii.
	Aquæ ...	...	...	...	ad ℥viii.

M. F. lin. Sig. : Apply as above.

CHAPTER XVII

THE TREATMENT OF TETANUS

A LARGE number of drugs have been tried in the treatment of this disease, and the general consensus of opinion is that the influence of any special agent is very doubtful in promoting recovery.

In practice we meet with many cases which may be described as subacute. In these, although the characteristic symptoms of the disease are present, they exist in a modified form. The patients are able to feed on soft diet; the symptoms develop slowly; the nervous excitement which is observed in acute cases is greatly modified. The course of the disease is slow, and the symptoms gradually subside.

These cases usually tend to recover with simple treatment, such as placing the animal in a perfectly quiet stable, allowing soft diet, giving a purgative dose of calomel in the food, and administering the extract of belladonna in the form of electuary.

The modern treatment of tetanus by means of the anti-tetanic serum has not proved as successful as was anticipated.

In acute cases that develop rapidly, and in which trismus soon appears, we have not found the serum of any value. This is explained by the fact that in such cases the toxin is exerting its action on the nervous system before we commence treatment, and the serum produces little effect. Nevertheless, in the case of valuable horses, we are of opinion that along with other details of treatment the serum should be used, as occasionally cases are reported in which, even with severe symptoms present, recovery has occurred.

In the subacute form of the disease, already mentioned, we invariably adopt the serum treatment in the case of valuable horses, although it is difficult to state whether the results would have been different had we used ordinary measures. Of course, the earlier this treatment is adopted the better, as it is impossible to foretell what course the disease will take.

If on the first appearance of the symptoms of tetanus the serum were used, we have no doubt but that it would prove of value, and many cases would be saved. But, unfortunately, in practice we find that the earlier symptoms are overlooked by the owner or groom, and when our attendance is requested the disease has fully developed.

One drawback to the serum treatment in country practice is the expense involved. Not only is the agent itself high in price, but the case must be visited once or even twice daily in order to carry out the injections.

As medicinal agents are usually given in conjunction with the serum treatment, it is difficult to appreciate the exact part that the latter takes in those cases that recover.

The first essential in the treatment of tetanus is to place the patient in a perfectly quiet box-stall away from other animals. Although proper ventilation should be allowed, the stall should be darkened, or at least bright light prevented from entering it.

One attendant should be placed in charge, with strict instructions to approach the animal quietly, and not to excite him in any way, and above all things to prevent other persons from entering the stall.

The serum should be injected as soon as possible, adopting the precautions mentioned on p. 396. This procedure can be carried out with very little inconvenience to the animal by using a fine hypodermic needle. The best form of hypodermic syringe and needles is that of Dr. Roux, Paris, manufactured by Gassélin. The ordinary type of needle sold for veterinary use is far too large and clumsy, and this remark will apply for all hypodermic purposes. In severe cases the serum should be injected twice daily; in the milder forms once a day is sufficient. The usual period of time during which it

is necessary to continue the injections is from eight to ten days. Some practitioners advise the administration of an aloetic purgative in the form of bolus. This often has the effect of exciting the animal, and if any degree of trismus be present, it is difficult, if not impossible, to administer; also it frequently fails to act and produces nausea, thus interfering with appetite.

We prefer to administer calomel in the food, giving 2 drachms morning and evening until the bowels are acted on. If the animal refuses food the drug can be given in the form of electuary. We administer from 1 to 2 drachms of extract of belladonna three times daily in the form of a soft electuary. This can be easily given without exciting the animal, by placing it on the back of the tongue or between the molar teeth by means of a long-handled spoon. Local applications to the spine we have not found of any value. The application of a fresh sheepskin is advised by some practitioners. Soft food should be allowed, and if the animal will take milk it should be supplied *ad lib.*, care being taken that it is fresh, and that the vessel containing it is kept perfectly clean.

The use of slings in cases of tetanus is a point on which practitioners differ. Some horses take quietly to them, and in cases where weakness is a prominent symptom they may be employed; but others, especially nervous and excitable animals, are far better left without slings.

The wound which is the source of entry of the tetanus bacilli will require attention. This may be found partly healed or otherwise; but in any case, whenever practicable, it is advisable to excise and remove the tissue around the part. This can be done in a painless manner, and without exciting the animal, by first injecting a solution of eucaïne and adrenalin deeply around the part (see p. 389). The resulting wound should then be washed with a strong antiseptic solution, and a dressing of boric lint soaked in hot water applied. In the case of tetanus occurring in a horse that has been recently docked, the stump of the tail should be redocked. The hæmorrhage can be checked by applying

a strong preparation of compound tincture of benzoin and a pledget of carbolised tow, secured by means of a bandage.

It must be understood, however, that excision of the tissues at the seat of infection is only likely to prove of service in the early stages of the disease. If a sufficient amount of the toxin has already been fixed in the nerve-cells of the central nervous system, excision cannot affect the course of the disease. Possibly it may prevent a further supply of toxin from being formed. We meet with several cases of tetanus in which we cannot discover the seat of infection.

Many of the cases of tetanus that we are called on to treat are hopeless, in consequence of being far advanced. Others, again, are of such a severe type that the symptoms progress with great rapidity. When the jaws become firmly locked, and the animal cannot take even fluid nourishment, treatment of any kind is seldom successful. When convulsions occur and the patient goes down he should be promptly destroyed. Tetanus occurring in foals is, in our experience, almost invariably fatal. The infection probably enters by the umbilical cord.

As a *preventive* of tetanus the antitetanic serum is now universally recognised as being of marked value, and is largely employed for this purpose. In districts where the disease is prevalent it should be used in cases such as punctured wounds, especially in the region of the foot (see p. 395).

CHAPTER XVIII

THE TREATMENT OF MILK FEVER

UNTIL recent years the above was one of the most fatal affections to which the cow was subject. Various were the theories that authorities propounded with reference to the pathology of this disease, and numerous were the names that were suggested to adequately express its nature. The treatment adopted was heroic in the extreme, and although occasionally a few cases survived the attentions of the therapist, the great majority succumbed. Drastic purgatives, bleeding, large doses of stimulants, etc., failed altogether to produce any good results, and in our present state of knowledge we are aware that such lines of treatment only contributed to a fatal issue.

The first glimmer of success appeared when the treatment by means of chloral hydrate was introduced, and no doubt it very frequently gave successful results. If it did not prove of equal value in all districts, it at any rate gave the animals a chance of living, which the old-time heroic treatment failed to accomplish.

To Herr Schmidt, veterinarian, of Kolding, South Denmark, must be given the credit of first placing within our reach a simple and effectual method of treatment for this affection. It is only those who have had experience with this disease that can properly appreciate the enormous benefits which this veterinarian has conferred on veterinary science and owners of cattle by his discovery.

Before then no practitioner desired to encounter a case of

milk fever, because he was perfectly aware of his utter incapacity to render any service either to the animal or to his client. Now, however, if he is called to the case sufficiently early, and before the animal has been dosed with Epsom salt and stimulants, he feels confident of his treatment being successful.

What is known in every district as the Schmidt treatment is founded on the theory that some poisonous substance is formed in the udder of the cow, probably through over-activity of the epithelial cells of the gland, excited by the determination to the udder of the large amount of blood which previous to delivery was supplied to the uterus and foetus. Another theory is that the disease is due to the presence of anaërobic micro-organisms, which manufacture toxins in the udder and set up an intoxication of the nervous system.

Without entering into a discussion with reference to these theories, we have only to remark that the results obtained from treatment directed to the udder are quite sufficient to enable the most sceptical mind to admit that this organ is the starting-point of the disease.

Schmidt's original treatment consists in the injection of a solution of potassium iodide in boiled water into the udder. From 2 to $2\frac{1}{2}$ drachms of potassium iodide are dissolved in a quart of water sterilised by boiling, and one-fourth of this is injected at a temperature of 104° F. into each of the teats with a simple apparatus. Previous to this procedure, the milk is thoroughly removed from the udder, and the latter cleansed with a 5 per cent. solution of carbolic acid or a $1\frac{1}{2}$ per cent. solution of lysol. After injection the udder is gently massaged, so as to distribute the fluid in the organ. This treatment was later on modified by injecting air into the udder along with the fluid.

In cases where cardiac weakness is a prominent symptom, Schmidt advises the hypodermic injection of 75 grains of caffeine sodio-salicylate.

The apparatus employed for the udder should be rendered thoroughly aseptic, also the solution and the vessel containing it; otherwise an attack of mammitis is likely to follow.

Modifications from time to time were made in this treatment, and practitioners ascertained by experience that any antiseptic solution proved as effectual as that prepared with potassium iodide. Indeed, cases were reported of mammitis occurring in spite of aseptic precautions, and this agent was suspected of causing it.

Chinosol for a long period has proved a useful agent for this purpose. Different strengths are used, but we find that one containing 30 grains of this drug to the quart of boiled water to be effectual. At the same time, we must admit that any antiseptic agent can be used for the purpose, as one does not possess any special value over another.

Further experience in the treatment of milk fever revealed the fact that recovery could be brought about by simply injecting air into the udder until the gland was fully distended. Hence a large number of cases of this disease are now successfully treated by injecting air and omitting the antiseptic solution.

The injection of oxygen into the udder has also been adopted with great success.

The disease may thus be treated by the following methods :

(a) By injecting an antiseptic solution and then distending the udder with air. A simple apparatus suffices for this procedure, consisting of a rubber syringe attached to a teat catheter. After the fluid has been injected the ball of the syringe should be worked vigorously, and each quarter of the udder distended in turn with air. This method we adopted in a large number of cases with marked success.

(b) By the injection of air alone. A special apparatus is devised for this purpose, although not essential. This apparatus is termed the Zehl-Evers air filter. It has double-hand bellows, two teat catheters, with rubber compression stalls for fitting over the teats, and the air is made to pass through sterilised wool before entering the udder. With this instrument much labour is saved, as two quarters of the udder are filled with air at the same time.

In order to prevent the air from escaping while the udder is being massaged, a set of teat compressors is useful, the

pattern known as the 'Lewis Lloyd' acting well for this purpose.

(c) By injecting oxygen. For this a special apparatus is necessary. We do not consider this mode of treatment necessary, except in cases characterised by a marked degree of coma.

The following is a brief outline of the plan of treatment that we find successful:

First have the cow milked thoroughly dry; then rub the udder all over with chinosol soft soap. Sterilise the teat catheters of the air apparatus by placing them in boiling water for a few minutes. Cool them in a 2½ per cent. solution of lysol or cyllin, and apply a little boric ointment, or any simple antiseptic ointment. Insert the catheters into the teats carefully and adjust the rubber teat-stalls. Work the bellows regularly until the udder becomes distended with air and the teats become firm. Remove the catheters and apply the teat compressors to the teats. Disinfect the catheters, and carry out the same procedure on the other quarters of the udder. Massage the udder gently, so as to diffuse the air through the gland. The teat compressors may be allowed to remain on for a few hours and then removed. Next place the cow in a natural position—*i.e.*, lying on the sternum—and keep her thus by placing bags firmly filled with straw against her shoulder, and another similar bag for her head to rest on. Direct an assistant to keep her head from falling to one side. See that the underneath hind-leg is arranged so that it will not become cramped, also that the udder is not pressed upon by the animal, and see that the bedding is clean. Draw off the urine with the catheter and administer an enema of warm water. Rub into the spine a strong liniment composed of oil of turpentine, strong solution of ammonia, and linseed-oil. Give instructions that the animal is *to be turned on the opposite side every three hours*, and carefully packed with the bags of straw, so that she cannot lie extended on her side; also she should not be milked for at least eight hours.

If improvement does not occur in about eight hours, the

injection of air should be repeated. Improvement is manifested by the animal being able to hold her head without any support and by her general appearance. Some cases get up in a few hours after the above treatment; in others recovery is slower, and they may not rise until the next morning.

No purgative of any kind is required. The bowels usually act in a normal manner when consciousness returns. Occasionally in the early stages excitement may be present, and the animal is inclined to knock herself about. In such instances we carefully administer 1 ounce of chloral hydrate mixed in 1 pound of treacle and a little water. This should always be administered by the practitioner himself, in order to avoid any danger of careless drenching; but in cases where the usual comatose symptoms are present no drench of any kind should be given.

If treatment has been too long delayed, or if the owner has already given the time-honoured dose of Epsom salt before our arrival, we have a more serious state of affairs to deal with. Usually the animal is allowed to lie at full length, and severe tympanites occurs as the result. This should be relieved by using the trocar and cannula.

When an advanced stage of coma is present, the injection of oxygen is indicated, and is far more likely to produce good results than air alone.

A most unfortunate sequel to milk fever is the occurrence of paralysis of the hind-limbs. This is more likely to arise in neglected cases, and in such very often proves incurable. Although consciousness returns, and the animal feeds and looks bright, she is unable to bear any weight on the hind-limbs. In other instances evidences of lung complications are present, very often caused by the owner administering drenches.

Usually if the animal does not get up by the second day the prognosis is very unfavourable. We have tried the hypodermic injection of strychnine, also counter-irritation to the spine in such cases, but seldom with any good results.

On the day after the attack, if the animal does not get up,

she should be assisted to rise by means of a strong piece of sacking placed underneath the body, and raised by a few men at each side. If she can only be got to rest on the limbs for a short time, at intervals, some hopes may be entertained of recovery. Hypodermic injections of strychnine should be given in doses of 1 grain three times a day.

Some cases of this disease appear to be of a far more serious type than others, profound coma setting in very quickly. Even in such instances treatment should be attempted, as it is often surprising to find the apparently hopeless cases that recover. Occasionally we have found that the injection of the antiseptic solution, followed up with that of air, succeeds better in such instances than the treatment with air alone. Probably the absorption of the fluid into the system exerts a beneficial effect.

An important point in the treatment of milk fever is that the udder treatment should be continued on the day following the attack if the animal is not progressing favourably, and no case should be given up as incurable until evidences of permanent paralysis are present. We have found the hypodermic injection of strychnine very useful in these protracted cases in conjunction with the udder treatment.

In using solutions for injecting the udder, care should be taken that the water employed has been sterilised by boiling, and also that the vessel containing it is similarly treated, otherwise mammitis is likely to ensue. In country practice these details cannot be carried out with facility, and delay is often caused thereby; hence the method of treatment by injecting air only is found more convenient.

We may remark that the latter agent can be injected with the ordinary simple rubber syringe and teat catheter which is used for the injection of the antiseptic fluid. This is more portable, convenient, and less liable to become damaged than the more elaborate apparatus already mentioned.

During convalescence from milk fever it is of importance to avoid excessive feeding, otherwise digestive troubles may ensue. A cow having suffered from one attack of milk fever

is likely to again suffer from the disease at the next calving period.

We have treated several cases in which a second attack occurred, but have not observed that the latter was any more severe than the primary one. A few instances have also come under our notice in which the disease appeared a short time before calving.

From our experience of this affection, we come to the conclusion that if professional attendance is called early the large majority of cases will recover, and this is a point which cannot be too firmly impressed on stock-owners.

We may also remark that attention to this simple detail is of far greater value than attempting to treat the disease themselves, a course which can only end in loss and disaster.

The prevention of milk fever is of importance. Medicinal agents of any kind have no influence in this respect, although many patent medicine vendors do a large trade in the sale of so-called preventives, and are able to deceive a credulous public. As cows in high condition are usually those which are attacked, it is advisable to keep such animals on a restricted diet for some time prior to calving, and to administer a moderate dose of Epsom salt about a fortnight before this event is expected. In some instances, however, cows in low condition, that are given extra feeding just prior to the period of calving, may be affected by this disease. Under these circumstances we find cases of milk fever in cows the property of the poorer class of clients.

Among other preventive measures which have been found of value, we may mention that of leaving the calf with the cow for four or five days after calving; or, if the calf be removed, as is usually the custom, the udder is not to be milked dry, but should be milked at intervals instead. In spite of all these precautions, however, the disease may occur. Owners of cattle should be instructed with reference to the primary symptoms of milk fever, so that they may be enabled to call in professional assistance early.

CHAPTER XIX

SECTION I

THE TREATMENT OF CANINE DISTEMPER¹

CANINE distemper is a prostrating contagious disease which runs a variable course, with or without disturbance of the heat-regulating centre, and characterised by a cutaneous eruption, and catarrh of the various mucous membranes, and often followed by serious alterations of the nervous and cutaneous systems.

It occasionally runs a rapidly acute course ; but frequently this is deceptive, as that which is taken to be the naturally acute course is in reality only a later phase of the disease, the initial or milder symptoms being not rarely overlooked. Thus the disease may be ushered in with a slight but temporary elevation of temperature, a cutaneous eruption, a staring coat, slight dulness, capricious appetite, a watery eye, and diarrhœa or vomiting. These may pass away for a week or two, or even longer, until some sudden outburst of fresh phenomena is manifested.

It attacks dogs of all ages from birth up to old age, and its mortality is greater where a large number of animals, even mongrels, are congregated together than where one or two are kept, and also at the two extremes of life. As a general rule, however, it is in the majority of instances encountered in dogs between six and twelve months old, this

¹ This chapter has been written by Mr. Henry Gray, M.R.C.V.S., Kensington, W.

being the period at which they are most likely to come in contact for the first time with dogs suffering from the disease.

Usually distemper runs its *course* within a month, but not rarely this may be extended to two, three, and even more months. Occasionally an animal seems to suffer no more than 'a mere catarrh,' and is well within a week.

Relapses are very common—that is, a secondary infection or complication sets in after a recovery has become apparently established.

Recurrence.—Although absolute recovery from a previous attack of distemper gives marked immunity in the majority of cases, it by no means follows that it confers absolute immunity, as second and even third attacks in the same dog are encountered.

Elevation of Temperature.—Distemper is said to be a febrile disease, and this is true with reference to the elevation of temperature that may arise during the inception, or even the general course of some of the phases of this affection, in particular epizootics. But this description is too general and not quite exact if applied to the complaint widely, as at times a great number of cases do not manifest any, or at most very little, disturbance of the heat-regulating system.

However, the temperature is often elevated (hyperthermia) during the initial stage of the disease, or at the commencement and even during the course of a complication or secondary infection of an important organ, such as the lungs or central nervous system.

On the other hand, a subnormal temperature (hypothermia) is frequently seen when the toxin has rapidly formed and produced a profound impression upon the nervous system. This is not necessarily a grave sign, as many such cases react to it, and end in perfect recovery.

Again, a dog may not manifest any disturbance of the normal temperature during the course of distemper, and yet in the end may die of the disease.

On the contrary, a high temperature that continues for

some time, especially during the earlier stage, may be followed by absolute recovery. Still, if arising late in the course of the disease or after an apparent recovery, it is often an indication of some complicating infection, particularly of the nervous system or lungs, and is therefore generally a grave sign, as these cases mostly end in death or non-recovery.

In conclusion, the clinical thermometer is not very trustworthy in the diagnosis, prognosis, or treatment of this disease.

Emaciation.—In a great number of cases a gradual loss of condition occurs during the earlier stages of this complaint, especially if accompanied with elevation of temperature, profuse diarrhœa, and very little appetite. In itself it is not a bad omen. On the contrary, if the emaciation is very rapid in its progress, and is accompanied with profuse watery diarrhœa, which nothing will check, and if there is a total loss of appetite, and a semi-comatose condition, associated with an offensive odour given off from the cutaneous system, it is generally a fatal prognostic.

The emaciation is not as a rule due to want of nourishment, as, howsoever liberally an animal may be fed with highly-concentrated foods, the wasting may be in inverse proportion to the quantity of food given. It is due to rapid tissue change (metabolism), brought about by the bacteria on the one hand and the altered function of the alimentary system on the other. However, in the milder or chronic cases of distemper, where the appetite is fairly good, an insufficient or irregular supply of suitable food will increase the emaciation, and if continued for a length of time, the animals have the appearance of those that have been wilfully denied food. Such cases should not be confounded with those having a similar condition, due to severe chronic enteric catarrh, inflammatory changes of the mesenteric glands, suppurative broncho-pneumonia, desquamative nephritis, albuminuria, etc.

At times there is no loss of condition even when there are such serious complications as meningitis and myelitis, with delirium, convulsions or a semi-comatose state.

Cutaneous Phenomena.—During the earlier stage of distemper, especially in young dogs, there is generally a characteristic eruption on the skin inside the thighs and arms and under the abdomen, and occasionally also on the inner surface of the flap of the ears. At times it may become generalised all over the body. The eruption consists of an elevation of the cuticle, caused by an effusion of serum or sero-purulent material. It varies in size from a pin's head to a hempseed up to a split-pea or small bean. It is usually circular or ovular in form, and during its early stage may be surrounded with a pinkish or purple areola. It may burst within twenty-four or forty-eight hours, leaving a thin crust or shred of cuticle on a moist surface. This eruption is usually discrete, but occasionally one runs into the other, forming a large abraded surface, scabbed over by débris of cuticle, dried serum, and dust. At other times these give the skin an abraded, greasy appearance, with a profuse discharge of a sero-fatty offensive material, which renders the bedding damp, as if the animal had been perspiring freely. This condition may be accompanied with a deep pustular eruption, and rapid loss of the hairy covering of the body. The eruptions, however, are usually one, two, or more in number, or may even be innumerable. Frequently one crop disappears for another to appear, and this may be repeated several times during the course of the disease.

This primary eruption should not be suppressed by exposure to cold or wet weather, or by bathing or medications, but rather encouraged. It is frequently the only external symptom of distemper, and may be mistaken for an ordinary skin disease.

A very common occurrence towards the end of the course of this complaint is the appearance of a generalised eruption. It resembles that of follicular mange or acne. At other times multiple subcutaneous abscesses of the size of a pea to a bean or Spanish nut may appear after an apparent recovery from distemper. They contain a bloody purulent material. Frequently they run into one another, and when

the pus has escaped therefrom, they give the skin a lacerated appearance.

If not properly treated, these cutaneous sequelæ may persist for a long time or even indefinitely, or become incurable from disorganisation of the cellular elements of the epidermis, and also of the sudoriparous and sebaceous glands and hair-follicles.

It should be mentioned that other skin diseases may arise during the course of distemper that are not peculiar to it. Such are eczema, ringworm, follicular and sarcoptic scabies, phthiriasis, alopecia, etc.

Ophthalmic and Nasal Phenomena.—It is generally asserted that the principal characteristic of canine distemper is a catarrhal discharge from the eyes and nostrils; but although this may be true in a great number of instances, it is not so for all cases, as many run their course and end in recovery or death without manifesting this symptom.

In some instances, when this symptom is present, the discharge may be only a watery one for a few days or a week or longer, and then pass away altogether, or at least for a time, to reappear after a varying interval of one or several weeks. This is followed by intense congestion of the conjunctival and nasal mucous membranes, which give off first a greyish mucus and soon afterwards a straw-coloured clotted or greenish, resinous material which adheres to the eyes and nostrils. This may prevent the former from opening, and cause the latter to become completely blocked, so that the animal cannot breathe through the nostrils.

In many cases the conjunctival, and in others the nasal membrane is alone affected.

Frequently the catarrhal discharge causes excoriation of the cuticle round the eyelids or nostrils.

Usually the catarrhal condition of the nasal and conjunctival membranes does not appear before the seventh day; but in a few cases this may take place after the third or fourth day following the first appearance of the disease.

In very acute and grave outbreaks of distemper the muco-

purulent or purulent discharge from these parts may be tinged or mixed with blood.

During some seasons the conjunctival membrane may be so swollen that it protrudes over the front of the globe and overlaps the eyelids of one, or at times both eyes, giving these organs—the corneæ of which are hidden—an angry, red, fleshy appearance, and discharging a thick, yellowish, creamy material (‘pink-eye’ form of distemper).

The catarrhal process may not only attack the conjunctival mucous membrane, but also extend to the cornea, and even the deeper structures of the eye. As a rule, when it affects the cornea it is in the form of a minute vesicular eruption, which results in ulceration of one or two spots, usually in the centre or a little above the centre of this structure. It is generally preceded by dread of light (photophobia), spasm of the eyelids, profuse lachrymation, and accompanied with pain. After a time the cornea becomes opaque, which gives it a greyish or bluish-white appearance, and eventually minute bloodvessels spread out in a network, fringe the circumference of the sclero-corneal juncture, and ultimately extend to the ulcers. The ulcers, which may attack one or both eyes, vary in depth as well as in circumference. They may be no larger than the outline of a pin’s head, but may attain the size of that of a split pea. Their depth may be shallow, only extending to the superficial layer of the cornea, or deep, even to perforating the whole thickness of the membrane, allowing escape of some of the fluid contents of the anterior chamber, with protrusion of the free edge of the iris, which prevents any further escape of fluid and which forms a pea or grape like growth on the front of the eye. Or the ulcer, although being deep, may not extend through the whole of the thickness of the cornea, stopping short at Descemet’s membrane, which, losing its anterior support, is pressed through the ulcer in consequence of the intra-ocular pressure of the fluids, and forms, as in the perforative ulcer, a pea or grape like projection, constituting *staphyloma*. As in the deep perforating ulcer, the free edge of the iris may be pressed forward and become included in the corneal gap.

Not rarely, after all the active phenomena of distemper have passed away, and convalescence has become established and recovery taken place, a chronic purulent conjunctival discharge remains. This has been attributed by many ophthalmologists, who have no practical acquaintance with veterinary pathology, to gonorrhœal conjunctivitis, contracted from man. It may even persist, or at least recur, at intervals during the remainder of the animal's natural life. Frequently the opacities resulting from the corneal ulceration become permanently established, and therefore incurable. Cataract, amaurosis, etc., may be left as sequelæ.

Respiratory Phenomena.—A very common phase of canine distemper, especially during wet, stormy, or boisterous weather, is the catarrhal condition of the mucous membrane of one or more sections or of the whole respiratory channels. It may appear in the form of a laryngitis, laryngo-tracheitis, bronchitis, or broncho-pneumonia. At other times we may get a hæmorrhagic pneumonia, suppurative conditions of the lungs, and, more rarely, lobar pneumonia associated with a pleuritic effusion.

Any of these phenomena may run a rapid course, and end in death or recovery within a week or ten days. On the other hand, and not infrequently, they take a long time before resolution occurs or death ends the scene. Without fear of contradiction, one may say that they are, next to the nervous phenomena which very commonly follow the pneumonic complications, the most serious localisations, or rather complications.

They are not the essential phenomena, but rather the epiphenomena, of canine distemper, which may manifest themselves early in the course of the disease, or appear at a remote date from the earlier or eruptive stage, or after an apparent recovery. Frequently the acute pneumonic infection runs concurrently in the same animal with the essential infective process.

In young dogs convulsions are associated with the early broncho-pneumonic process; the latter, without a careful stethoscopic examination, is often overlooked until a post-

mortem examination is made. There may have been no cough or disturbance of the respiratory rhythm during life to lead the observer to suspect that there was anything amiss with the animal's lungs.

Alimentary Phenomena.—Frequently disturbance of the digestive system, such as diarrhœa or vomiting, is the first indication to attract the attention of the observer that the dog, especially a young animal, is not well. Under rational treatment it may pass away; or when vomiting is due to a catarrhal condition of the stomach (it may also be of centric or cerebral origin) it may persist, especially if the animal is irrationally fed or dosed with unsuitable remedies; or the diarrhœa, if due to a catarrhal condition of the intestines, may also persist, and very frequently causes after a time straining, which may not rarely in young puppies be followed by simple or complicated intussusception, prolapsus of the colon, rectum, or of the anal mucous membrane.

The catarrhal condition of the stomach or intestine, or perhaps both, may run on to inflammation of the deeper layers of the mucous membrane, and the intestinal inflammation is sometimes followed by ulceration, evidenced by much straining, passage of bloody stools, and emaciation.

Not rarely the gums, especially those portions surrounding the necks of the teeth and those portions of the labial and buccal mucous membrane in contact with the outer surface thereof (chiefly the incisors, canine, and carnassial teeth) become spongy, or the seat of catarrh, ulceration, or even gangrene. If these are accompanied with a brownish slimy material lining the teeth and cheeks, and set in late, when the animal is already debilitated from the disease, or follow on gastric and intestinal catarrh, they become a serious menace to life by setting up an acute septic intoxication. Very often in young dogs these oral phenomena, beyond an early cutaneous eruption, are the only ones observed in distemper, and when occurring during the period of the appearance of the second dentition the enamel of the teeth becomes eroded and indelibly stained.

Exceptionally, jaundice is observed in canine distemper.

It is of hæmal origin, and is not caused by the catarrhal condition of the bowels, which may sometimes coexist with jaundice. Nor is it due to catarrh of the bile-duct or to intussusception. It may occur in the absence of any of these commonly concomitant conditions, and is not often associated with an overfilled gall-bladder, but rather the opposite. On the other hand, we often observe a very distended gall-bladder without jaundice.

Nervous Phenomena.—The nervous phenomena are, as mentioned above, the gravest of this malady, and may occur early or late during the course of distemper, or appear at a remote period following an apparently absolute recovery.

The convulsions, or 'fits,' are mostly of centric or cerebral origin, and are produced by an infection of the central nervous system. They are, as we have said before, usually associated with broncho-pneumonia, or, more rarely, lobar pneumonia, which, in the presence of them and without showing any disturbance of the respiratory rhythm or cough, is frequently overlooked, and perhaps not discovered until a post-mortem examination is made.

The convulsions are the expression of an infected nervous system, and are symptomatic of meningitis or myelitis or ventricular effusion. These in their turn give rise to peculiar nervous disorders, such as chorea, paresis, paralysis, delirium, idiocy, amaurosis, deafness, loss of smell, vertigo (turning in a circle), wandering aimlessly about and not avoiding obstacles, unconsciously looking about or at the walls, etc., cervical spasm, depraved appetite, unequal degree of contraction or dilatation of pupils, nystagmus, etc. Nevertheless, meningitis or myelitis may appear without any convulsions.

As a rule, when the nervous system becomes infected, death takes place from exhaustion or coma, or if the animal survives it remains incurable, or at least not totally curable. However, one sometimes sees a sudden slight paresis, paralysis, or hysteria, which disappears almost as soon as it appears; at other times choreic movement of the limbs, gradually passing into paraplegia, and eventually vanishing altogether; occasionally paralysis of all four limbs and

inability to stand upon them, lasting for months, with ultimate recovery. Again, we have observed chorea almost suddenly leave a dog after having been so affected for a period of six years. On the other hand, we have known a case where a poodle affected with chorea for a period of two years had the misfortune to be seized with distemper a second time, which so increased the severity of the choreic twitchings that its owner had it mercifully destroyed to save it from further suffering.

Finally, one may see an isolated attack of convulsions, probably due to some peripheral irritation, produced by teething, worms, œstrum, etc., whilst the system is debilitated by distemper, end in recovery, especially if the source of irritation be removed. On the other hand, as these conditions may be present during distemper, it is by no means an indication that they are a source of irritation so as to set up convulsions. If, however, they are removed and no more convulsions occur, it is fair to allow that they were the *source of disturbance*.

Treatment.

This disease is, as I have endeavoured to show above, a pleiomorphic one, and in spite of all hygienic and medicinal treatment, will run its course. However, the better the hygienic conditions the animal is placed in, the milder that course is likely to be. When a dog is known or suspected to be incubating in its system the infective agent of canine distemper, evidenced by an unaccountable dulness, loss of appetite, wasting in condition, and perhaps associated with vomiting or diarrhœa, he should not be exposed to a chill or fatigue, especially during wet or changeable weather, which may further lower the vitality of the defensive system and allow secondary infections, arising either within or without the body, to take place.

During the struggle between the invading micro-organism and the defensive cells immunising substances are formed within the blood-stream, which act as bacterial solvents (bacteriolysins) or as neutralisers of toxins (antitoxins) formed

by the bacteria. These substances may in time overcome the original infection, and the animal recovers. If, however, the already weakened body becomes submitted to other adverse influences, such as improper feeding, insanitary surroundings, or overcrowded kennels, fatigue or exposure to draughts or wet weather, etc., or is brought into contact with a complicated infective case in another dog, the defensive cellular elements are not in a fit state to ward off the ever-threatening secondary or complicating infections arising from the mouth or intestine, or from without the body.

We should endeavour to imitate as far as possible the brewer in the brewing of beer. He places the wort in a favourable condition as to temperature, etc., so as to bring the fermentative process to a proper termination, without allowing extraneous germs to get a foothold in the medium, and thus defeat the desired object. In our practice, however, it is a thing more easily said than done.

From what little we do know of the immunising process of natural and experimental infection, we can quite understand that in a great number of cases natural immunisation and recovery is brought about without complications (secondary infections) when animals are recognised early to be suffering from distemper, and then carefully nursed and rationally treated. The first object to be aimed at is to separate the sick from the apparently healthy animals, and afterwards separate the sick animals themselves from one another, so as to avoid their catching complications should any develop such. Early recognition of the disease is essential for the mitigation of many of the evils usually accompanying this most disastrous disease of the dog.

The animal should be kept in a warm, dry, well-lighted and well-ventilated room, without draughts, which may during the cold months of the year or during inclement weather require to be heated artificially. Short-coated animals should under these latter conditions be warmly clothed in a flannel coat, so as to regulate the general distribution of the circulation, and therefore body heat, which favours the cutaneous eruption coming out, and in

consequence relieves the system of much of its deleterious material.

To further assist this critical and essential process, diffusible stimulants, such as spts. æther. nitrosi and liq. ammonii acet., singly or combined, are advised. The *tinctura ferri pomata* (P.G.)* is also recommended, and if these should bring out a good crop of vesicular pustules it is a good omen to be sought for. If, however, no good results are obtained, and the temperature remains high and the total loss of appetite persists, the hyperpyrexia should be modified, if possible, by means of *quininæ salicylas* (1 to 5 grains) and *sodii salicylas* (5 to 10 grains), which is a suitable dose for a fox-terrier, given three or four times a day, either as a powder dropped on the tongue, or in a pill, capsule, or cachet.

It has been thought that by injecting stimulating materials into the body the cells endowed with the power of resisting the entrance of extraneous germs would thereby be increased in activity, and thus be better able to destroy the infective agents that had already gained entrance and were multiplying and depressing the system. With this object in view, Zimmerman, of the Buda-Pest Veterinary School, after trying it on over one hundred distempered dogs, recommends the hypodermic injection in doses of 5 cubic centimetres (85 minims) of a solution of 1 part of trichloride of iodine in 2,000 parts of distilled water. He claims for it that it shortens the incubation and produces good results if used early in uncomplicated cases of the disease. He is doubtful of its utility in cases complicated with bronchitis or broncho-pneumonia, or where there are signs of cerebro-spinal complications. He does not claim it as a preventive. With a similar object, the writer tried and obtained under identical conditions good results with the hypodermic injection of 5 to 10 minim doses of a solution of 1 grain of the acid hydrochloride of quinine in 5 minims of distilled water twice a day. This also had a good effect in the earlier

* *Tinctura ferri pomata* is prepared by dissolving 1 part of ferrated extract of apples in 9 parts of cinnamon-water. Ferrated extract of apples is prepared by digesting iron filings in the juice of sour apples.

stages of canine typhus ('Stuttgart Distemper,' or Abdominal Typhus of the Germans, and Hæmorrhagic Gastro-enteritis of the French ; see p. 698).

Before we proceed further with the medicinal treatment, it will be well to pause and take a survey of the dietary, which in a great number of cases is as important, if not more so, than the former, and which has been much neglected in our professional text-books. During the early stage, especially if there be an elevation of the internal temperature, it is advisable not to encumber the system with too much nitrogenous or indigestible material in the shape of food. As everybody knows, milk contains all the elements necessary to sustain life and build up the body—at least for a certain time—and as it is not an irritant to catarrhal mucous membranes (which require as much resting as possible), we cannot do better than utilise it as the staple nourishment of the distempered dog. If the appetite is good the milk should be mixed with bread or boiled with rice, and the animal allowed as much as it will take. On the other hand, if the appetite is totally in abeyance, small and repeated quantities should be forced upon the animal by pouring it slowly into the buccal pouch. When he cannot tolerate it in a given quantity this should be lessened, and if this amount cannot then be supported, it should be mixed with an equal quantity of effervescing soda-water. Nevertheless, if there be only a little appetite left, it would be better not to force any nourishment on the animal, as however small a quantity is taken voluntarily, it will do it far more good than all the forced feeding, which is very often injurious, or at least causes nausea, and destroys what little appetite the animal has left.

During the last few years bacteriological investigations made on dogs during various periods of abstinence and after food seem to show that during fasting there are very few micro-organisms that gain an entrance to the blood-stream from the mouth or intestine, whereas after feeding, especially with certain diets, several colonies of common intestinal saprophytes are obtained. Therefore, does it not seem

rational to suppose that Nature prompts the sick animal to refuse at certain times as much food as is not good for its well-being? Yet nearly everybody considers loss of appetite a symptom to be fought against vigorously by pouring more aliment into the patient's stomach than it would receive if well, when in reality it should be a signal to give what it will take, or force as little as possible upon it.

If the animal has been ill some time, and the appetite is still in abeyance when the temperature has dropped to normal, it may be deemed necessary to give well-made concentrated beef-tea or the white of egg as a change. We must not, however, overlook the fact that, should there be moderate but persistent diarrhœa, the beef-tea or other meat-extracts—the brand varying according to the fashion of the public or prescriber—are liable to increase the frequency and quantity of dejecta, thereby irritating the intestinal mucous membrane as well as further weakening the animal's system.

However, there are a great number of instances where dogs never go off their appetite for solid food, and, provided there is no hyperpyrexia or loss of condition, raw or cooked meat, biscuit, etc., may be given with benefit. Nevertheless, if there be a sudden crisis from a severe attack of distemper, and the animal immediately craves for solid food, it is advisable to be cautious, and not to commence to give a large quantity of it at once, but to do it gradually, so as to avoid any sudden relapse to a grave state or perhaps to induce convulsions. But although a sudden change from fluid to solid nourishment may set up convulsions or bring about a relapse, frequently these latter conditions are preceded by an intense desire for solid aliment.

When it is considered necessary to allow a return to solid diet, it is wise to commence by giving small quantities of raw meat, which should be scraped, chopped up finely, or passed through a mincing-machine, and repeated several times a day, the quantity being gradually increased according to the tolerance of the appetite or stomach.

On no account should such nauseous or irritating agents

as cod-liver-oil, iron compounds, etc., be administered where there is fever, loss of appetite, or a catarrhal state of the digestive system, as they not only increase the anorexia, but also the catarrhal condition, and perhaps set up vomiting or diarrhœa.

When there is *repeated vomiting* of a glairy albuminous-looking fluid or mucus, it is generally an indication that the stomach is the seat of catarrh. To remedy or improve this condition nothing is superior to bismuth carbonate or sub-nitrate of bismuth in 5 or 10 grain doses, alone or along with bicarbonate of soda and perhaps opium, the following being a suitable formula :

R Bismuthi carb.	...	grs. v. to grs. x.
Sodii bicarb.	...	grs. v. to grs. x.
Pulv. opii	...	gr. $\frac{1}{4}$ to gr. ss.
F. pulv. i. Mitte vi.		

The smaller quantities are a sufficient dose for a fox-terrier, and may be given, shaken on the back of the tongue, three times a day. If the opium should be contra-indicated it may be omitted, or cocaine hydrochloride may be used as an alternative. Bland or non-irritating liquid food should be given. Pure ice or aerated soda-water is useful in allaying gastric irritation. Counter-irritation or leeches over the region of the stomach are sometimes advisable.

If there should be *diarrhœa* of a profuse and persistent character, accompanied with an elevation of temperature, bismuth salts, β -naphthol, benzo-naphthol, charcoal, etc., may bring about an improvement. The following is a useful prescription :

R Bismuthi salicylatis	...	grs. vii.
β -naphthol	...	grs. iii.
Pulv. carbo. ligni	...	grs. ii.
M. F. pulv. i.		

This is a suitable dose for a fox-terrier, and should be mixed with a little milk, and dropped on the tongue, or, what is

preferable, given in a cachet three or four times a day.
Or this :

R Bismuthi salicylatis ...	...	grs. v.
Sodii salicylatis ...	...	grs. v.
Quininæ salicylatis ...	...	grs. ii.

M. F. pulv. i.

This forms one dose, and may be given as above.

Some experienced observers recommend small and repeated doses of calomel as an intestinal antiseptic.

During the earlier stage of diarrhœa an enormous number of the saprophytic bacteria may be removed from the alimentary canal by giving a mild antiseptic aperient, such as the following :

R Hydrarg. subchloridi ...	...	gr. i.
Hydrarg. c. creta ...	...	gr. i.

M. F. pulv. i.

This is a suitable dose for a fox-terrier. To be dropped on the tongue, and repeated daily if thought advisable.

The principles for treating diarrhœa, as in the case of vomiting, are to soothe the mucous membrane, check peristalsis, abstain from exercise or excitement, avoid laxative or irritating nourishment, as meat or its extracts, and to create alimentary antisepsis by rendering the secretions unsuitable for the development of deleterious bacteria.

The *dysenteric diarrhœa*, containing blood and mucus, indicating an intense congestion and even a slight abrasion of the mucous membrane of the posterior (so-called large) intestine, which is accompanied with straining, may be held in check by the use of large doses of the bismuth salts, or by the following pill :

R Hydrarg. subchloridi ...	...	gr. i.
Pulv. opii ...	...	gr. ss.
Pulv. ipecac. ...	...	grs. ii.

F. pil. i. Mitte xii. Sig.: One to be given three times a day.

After all the acute symptoms have disappeared, and convalescence seems in a fair way to be completed, there sometimes remains a chronic or persistent diarrhœa, which seems generally, with the usual treatment adopted, to be obstinate. I have found this condition to be controlled and ultimately checked with the following mixture, which appears to act as a specific :

R	Infus. caryophyll. conc.	...	} āā ḡiv.
	Infus. hæmatoxyl. conc.	...	
	Acidi sulphurici dilut.	...	
	Syr. zingib.	... ..	ḡii.
	Aquæ chloroformi	... ..	ad ḡvi.

The dose of this is a tea, dessert, or table spoonful (according to the size of the dog), to be given three times a day. Tannigen, or tannalbin, or coto bark, in tincture or powder, may be given for like purposes.

It is a popular idea that when a dog is suffering from distemper and taking very little or no food he has *constipation* when the bowels do not perform their daily function of evacuation. This is an erroneous impression, because the bowels frequently remain in abeyance, not because there is paralysis or weakness, or hardened or voluminous fæces, but in consequence of want of stimulus, due to lack of ingesta and absence of fæces, brought about by not partaking of a sufficient quantity of any solid food to induce that stimulus. Therefore, under these circumstances sick dogs should not be dosed with sundry doses of castor-oil, buckthorn, etc. However, if the bowels do not act for two or three days, warm water enemata may be given just to remove the small quantity of fæces, or perhaps fæcal mucus, from the rectum.

It seems needless to mention that the greater part of excrementitious material derived from liquid nourishment, such as milk or meat infusions, is removed by the kidneys instead of by the bowels.

The troublesome *ulcerations of the mouth*, including lips, cheeks, gums, etc., with their resulting gangrene and also necrosis of the adjoining bone, require attention. To

mitigate or even prevent these forming, the mouth should periodically be inspected, and if the teeth be dirty, covered with a grey or brownish scum, they should be brushed two or three times a day with the following lotion :

R	Quininæ sulph.	...	...	grs. xxiv.
	Acidi hydrochlor. dilut.	...	...	ʒii.
	Aquæ camphoræ	...	...	ad ʒvi.

M. F. lotio.

Or peroxide of hydrogen may be used for this purpose.

Young dogs shedding their temporary teeth should have all the loosened ones removed, else gangrene of the gum and necrosis of the adjoining bone takes place, thus rendering the animal liable to septicæmia, which, in presence of the existing debilitated condition, brings about death.

Should the animal recover from the disease, and be left with necrosis of the alveolar processes of the jaw, the dead bone is generally exfoliated, and the breach remaining becomes filled up with granulations. To assist this process the lotion mentioned above is suitable.

Very commonly we are called upon to treat the troublesome and harsh *laryngeal or laryngo-tracheal cough* set up by a catarrhal condition of varying degree of the upper portion of the air-tubes. To cut this short, the animal should be kept in a warm place and fed on warm food. A stimulating liniment, preferably the oil of mustard, should be well rubbed on the outside of the throat and course of the trachea two or three times a day, unless soreness of the skin be produced. Expectoration should be promoted, first by giving, if the animal is not too feeble, a hypodermic injection of apomorphine hydrochloride, the dose varying according to the size of the dog— $\frac{1}{80}$ to $\frac{1}{10}$ grain. It should be remembered that in giving this drug in too large a dose the object sought for is often obviated, and instead of an emetic or expectorant action, it produces cerebral excitement or restlessness. This may be followed up with a mixture such as :

R	Acidi carbolici	...	...	℥^{xxiv} .
	Spts. chloroformi	...	...	ʒii.
	Syr. scillæ acet.	...	...	ʒii.
	Vin. ipecac.	...	...	ʒii.
	Syr. Tolut.	...	...	ʒii.
	Syr. simplicis	..	...	ad ʒiii.

M. F. m. Sig.: A tea to a dessert or table spoonful
three times a day.

In old dogs with cardiac valvular disturbance tincture of nux vomica and tincture of digitalis ($\frac{1}{4}$ minim of the former and $\frac{1}{2}$ minim of the latter to every pound the dog weighs) may be added to this mixture. The neck and chest should be covered with a warm woollen covering.

The *broncho-pneumonia* which frequently occurs as a complication during distemper is very fatal, and requires the greatest skill in its treatment. That advised above for the laryngeal or laryngo-tracheal catarrh is applicable to this complaint after the acute stage has passed. During the early stage, when there is a high temperature and loss of appetite, the following is advisable:

R	Tinct. cinchonæ co.	...	...	} āā ʒii.
	Sodii salicylatis	...	...
	Spts. æth. nitrosi	...	...	ʒiv.
	Aquæ	...	...	ad ʒiii.

M. F. m. Sig.: A tea, dessert, or table spoonful (according to the size of the dog) to be given every four hours.

The skin over the breast and sides of the chest should be painted with strong tincture of iodine twice a day, until soreness is produced; or the oil of mustard, as recommended above, may be used instead.

On no account should the *short hacking cough*, which is so distressful and so frequent, occurring in fits of more or less duration, be stopped or checked, as it is Nature's way of relieving the bronchioles of the source of irritation. Its purposefulness may, however, be assisted by inhalations of steam, containing oil of eucalyptus, creosote, or cresyl, or by the vapo-cresyl lamp. Or intratracheal injections of

syr. ipecac. with glycerin of iodine (10 parts of the former to 1 part of the latter in 10 parts of warm water) ; or inhalations of oxygen may be tried in very severe and chronic cases.

As the catarrh of the air-passages and broncho-pneumonia are the result of an infection of the mucous membrane derived from the mouth, and not through the circulation, we should see that the animal has a proper supply of pure and warm air to breathe.

The *congestive or hyperæmic stage of pneumonia*, which is so frequently fatal, is probably an infection of the lungs through the circulation. It seems to produce its effects rapidly, and brings about death by cardiac failure or cerebral intoxication. Powerful stimulants, whether internal or external, seem to have the best effect. For internal administration the following is advised :

R	Tinct. digitalis	...	...	̄i.
	Tinct. nucis vomicæ	...	...	̄℥ xxiv.
	Spts. æth. co.	...	...	̄ʒii.
	Liq. ammon. acet.	...	...	̄ʒiv.
	Aquæ ...	...	...	ad ̄ʒiii.

F. m. Sig. : A tea, dessert, or table spoonful to be given every two or three hours.

Oil of mustard should be applied to the sides. Should there be a subnormal temperature and a semi-comatose or dazed condition, the injection of a few ounces of normal saline solution (7 in 1,000 ; 49 grains of sodium chloride in 16 ounces of boiled water), raised to 100° F., may be made under the skin. Inhalations of oxygen may also be used.

The *nervous complications* arising during the course, especially at the later or even convalescent stage of distemper, are very difficult to treat with success. Indeed, the majority of such cases, even if they do not succumb, are left incurable or maimed.

As to the *convulsions* arising from infection of the central nervous system, although they may be checked by the inhalation of chloroform or by the internal administration, by the mouth or rectum, of chloral hydrate, they as a rule

end in death from coma or pass away, to be succeeded by chorea, paralysis, etc.

Although bromides are recommended to check or mitigate these so-called but erroneously termed 'epileptic fits,' my experience leads me to conclude they are not only useless, but seem to aggravate the condition. Therefore I do not advise bromides for this class of convulsions occurring in distemper. Chloral hydrate is not much better. If it does calm them, as soon as its action passes off they recur with greater frequency, until coma sets in and death ends the scene. Chloroform inhalation certainly stops the convulsions, but after its discontinuance they, as in the case of chloral, recur.

The hypodermic injection of apomorphine hydrochloride, followed by that of morphine, may have a temporary beneficial effect, but, like the classical remedies already mentioned for convulsions, they are not of much, if any, permanent value.

It should be remembered that these convulsions frequently mask the presence of pneumonic lesions.

When there is *meningitis*, evidenced by delirium, restlessness, and excitement, especially at night-time, shaving the hair off the nape of the neck, and applying to the skin thus laid bare a blister, either of tartar emetic, liquor epispasticus, unguentum hydrarg. biniod., or strong tincture of iodine, and repeating it until soreness is produced, may be attempted, or the hypodermic injection of a few drops of oil of turpentine may be used instead. Or where there is an objection to any of these, the ice-bag may be applied after the skin has been wetted or damped with cold water. But, whatever treatment is adopted, not much hope should be entertained, as we find this condition in the dog is usually fatal, and if not immediately so, the destruction of the animal so affected is as a rule demanded by the owner.

The *chorea*, or twitching convulsions, that may occur in any of the systemic muscles or group of muscles, including those of the iris, eyelids, ear, jaw, neck, abdomen, limbs, etc.,

result from an infective or toxic action upon the nerve cells of the motor tracts, especially the anterior cornua, which after a time undergo degeneration and ultimately become replaced by fibrous or connective tissue (sclerosis). The damage is done to the nerve cells before they show it in the form of clonic convulsions, known in this case as chorea; hence the incurability of chorea, which, however, may become lessened in intensity as soon as the nervous and muscular systems regain their tone.

During the acute or early stage of chorea *on no account should nerve stimulants or tonics*, such as strychnine or nuxvomica, arsenic, phosphorus, etc., *be administered*, as they would add fuel to the fire by stimulating the already over-stimulated nerve-centres, and probably increasing their degeneration.

These agents and electricity are, however, indicated in this disease when all the active phenomena, such as an elevation of internal temperature, diarrhœa, pneumonic lesions, and catarrhal discharge have disappeared, and convalescence is established. For this object the following formula, which has given good results, may be tried:

R Strychninæ arsenatis	...	part 1, or grs. $i.\frac{3}{4}$
Aquæ destillatæ	...	parts 1,000, or $\tilde{3}iv$.

F. injectio.

Of this solution, 5 minims ($\frac{1}{200}$ grain) to 10 minims ($\frac{1}{100}$ grain), according to the size of the dog, are to be injected once daily for three or four days, and then again after an interval of the same period.

Notwithstanding the fact that a few dogs recover from this condition, after treatment or without it, perhaps by the effort of some inherent virtue of the tissues involved, there is no remedy yet demonstrated that will restore a degenerated part, and, in consequence, its function, to its normal state.

However, such drugs as sodium salicylate, phenacetin, antipyrin, morphine, etc., may be tried with the object of

soothing the irritable condition of the dog during the early or active stage of the lesion producing chorea. With this purpose in view, the following is a suitable pill:

R Hydrarg. subchlor. ...	...	gr. ss.
Pulv. opii ...	...	gr. ss.

F. pil. i. Mitte xii. Sig.: One to be given two or three times a day.

As regards the *paresis*, *paraplegia*, or various forms of *monoplegia*, the remarks made above upon chorea are here applicable, and in addition to the treatment advised it is well to mention the benefit of counter-irritation over that portion of the central nervous system involved in the changes giving rise to either of the above conditions. Oil of mustard, strong tincture of iodine, biniodide of mercury, or tartarised antimony in the form of an ointment, etc., may be tried.

Sometimes the paralysis is quite ephemeral, passing away almost as quickly as it appeared. Probably, under these circumstances, its appearance is due to some temporary toxic action or congestive or effusive pressure on the nerve-centres, which as soon as relieved would restore to the muscles implicated their nervous force.

The other nervous phenomena that appear occasionally during the course of distemper, or perhaps some time after an apparent recovery, such as 'going in a circle' (vertigo), difficulty in avoiding obstacles, loss of space instinct, loss of memory, smell, sight, hearing, etc., lateral curvature of the body or neck, etc., may also be treated on the same principles as for chorea and paralysis. It is perhaps worthy of note that most of the conditions just mentioned are not very, if at all, amenable to treatment. Still, if the owner desire it, it will become our duty to adopt some treatment.

Occasionally one may be asked to adopt some treatment for the *serous effusion into the cerebral ventricles* (hydrocephalus), although one may have doubts, and rightly so, of success. The following mixture may be tried:

R Potassii iod.	}	...	...	āā grs. xxiv.
Ammonii iod.	}	...	...
Tinct. digitalis		...	...	ʒi.
Syr. zingib.	...	...	...	ad. ʒiii.

F. m. Sig.: Of this a tea, dessert, or table spoonful should be given twice a day after food. Or, if there be a good appetite, doses of $2\frac{1}{2}$ to 10 grains of potassium iodide may be dissolved in water and mixed with the food twice a day.

The hair should be clipped or shaved off the cranium, and the part rendered bare painted with strong tincture of iodine or liquor epispasticus. If there is no vesication or pustulation, the painting should be renewed until this effect is produced.

If this treatment fail to give relief, it may be thought necessary to trephine the cranium over the central (medio-frontal) suture by means of a small trephine or gimlet, and puncture the ventricles in the central line with a small hypodermic or aspirating needle and draw off the effusion. Of course this would have to be done under the strictest aseptic precautions. After this the ice-bag may prove useful to combat any inflammatory reaction.

The catarrhal condition of the conjunctivæ (conjunctivitis), either associated with minute granuloma scattered over the membrane or not, may be moderated by astringent collyria. The following are useful formulæ:

1. R Chinosol grs. iii.ss.
 Aquæ destillatæ ad ʒviii.
 M. F. collyrium.

2. R Acidi borici grs. lxiv.
 Aquæ rosæ ad ʒviii.
 M. F. collyrium.

3. R Argenti nit. grs. xxiv.
 Spts. æth. nit. ℥ x.
 Aquæ destillatæ ad ʒvi.
 M. F. collyrium.

4. Perchloride of mercury or biniodide of mercury lotions, 1 in 2,000, may be used for similar purposes.

Whichever of these is selected should be applied by means of a piece of lint saturated with the lotion. The eyelids

should be drawn apart and outwards, so that a pocket is formed to receive the collyrium, squeezed out of the lint held a few inches above the eyelids. By doing this the collyrium gravitates all over the mucous membrane; the latter is thereby freed from the muco-purulent material, which floats upon the fluid.

After this is thoroughly applied the outer surface of the eyelids should be smeared with a weak boracic ointment, to prevent excoriation of the skin, and also the eyelids from adhering together.

When the muco-purulent discharge is excessive and forms very rapidly, it may be necessary to repeat this process three or four times a day. Under any circumstances it should not be done less than twice during the day.

If there should be any pain, expressed by intolerance of light and continual closure of the eyelids, whether accompanied with ulceration or other morbid conditions of the corneæ or irides (ulcerative or vascular keratitis, iridocyclitis), this should be relieved, so as to allow the eyelids to keep open and to permit the outflow of the muco-purulent discharge, and to remove the pressure on the eyeballs caused by their swollen and closed condition. For this purpose the following formula is advised :

R Cocainæ hydrochloridi	...	grs. x.
Atropinæ sulph.	...	gr. ss.
Aquæ destillatæ	...	ad ʒiii.

M. F. guttæ. Sig.: Two or three drops to be instilled between the eyelids two or three times a day. If thought necessary, the atropine may be omitted. Instead of these drops (guttæ) the cocaine ointment of the B.P. may be used.

If there should be any danger of the cornea becoming perforated by a small ulcer, which is so often present, the intraocular tension should be relieved. For this object the following drops may be tried :

R Eserinæ salicylatis	..	grs. ii.
Aquæ destillatæ	...	ʒss.

M. F. guttæ. Sig.: A few drops to be instilled between the eyelids every four hours.

For the resulting granulations filling up the ulcers the antiseptic collyria already recommended are sufficient. Or, instead of these, calomel, iodoform, or zinc oxide may be dusted into the eyes.

When the granulations are sluggish, or the remaining opacities obstinate, a mild stimulating ointment should be gently rubbed between the lids once a day. For this purpose the appended formulæ are generally recommended :

- | | | | | |
|----|---|---------------------------|-----|------------|
| 1. | R | Hydrarg. oxid. flav.... | ... | grs. xxiv. |
| | | Vaselin. | ... | ʒi. |
| 2. | R | Hydrarg. oxid. rub. ... | ... | grs. xxiv. |
| | | Vaselin. | ... | ʒi. |
| 3. | R | Ung. hydrarg. nit. (B.P.) | ... | ʒi. |
| | | Vaselin. | ... | ad ʒi. |

If for any special reason these strengths are too great, they may be diluted with vaseline according to requirement.

On no account should caustics be applied to affections of the eyes resulting from distemper, as they are most likely to convert a curable condition into a permanent blemish, even if they do not destroy the eye.

Sometimes there remains a persistent or recurring mucopurulent conjunctival discharge long after distemper has disappeared. In this case, therefore, it may be advisable to evert the eyelids and paint the conjunctival mucous membrane with a 10 per cent. solution of nitrate of silver; but care must be taken that this does not go on to the corneæ, and that before the eyelids are allowed to close the superfluous fluid and coagula are washed away by means of warm water containing a little common salt. This operation should be repeated at least twice a week for a few weeks, or until the trouble has disappeared.

The *exanthematous eruption* characteristic of distemper, and occurring during its primary stage, yet, nevertheless, often recurring during its course, should not be suppressed, but rather encouraged by warmth and stimulants. However, when it becomes generalised, and gives off an exudate which dries into a yellowish or resinous-looking material, it is likely to set up irritation and to be mistaken for mange. To allay

the irritation the body should be carefully smeared all over with sulphurated vaseline or zinc ointment, or, what is perhaps better, the animal should have a warm bath containing a small quantity of creolin. If this latter course be taken, care should be exercised to prevent the dog getting chilled, and also to insure that only a small amount of creolin be employed.

Although other skin troubles may arise during the course of distemper, I shall not discuss their treatment, but simply add that they should be treated according to the general principles applicable to cutaneous diseases.

However, I ought to mention that the multiple small hæmorrhagic subcutaneous abscesses arising occasionally after convalescence has become established, and attacking chiefly the under surface of jaws and limbs, but frequently the whole of the skin, should as soon as 'ripe' be opened, their contents squeezed out, and the skin sponged with a 5 per cent. solution of creolin. Finally, there is another skin disease which seems to be a sequel peculiar to distemper. The hair is rapidly shed, the skin becomes dry, pigmented, and encrusted with scales; but there is no itching, as in sarcoptic mange, nor does the sebaceous follicle contain the follicular mite, as in follicular mange. It is not contagious, but is liable to recur. All the dogs in a litter may have it. It requires, like follicular mange, persevering treatment. Creolin baths twice a week, or careful inunctions with the following ointment, produce satisfactory results:

R	Zinci oxid.	...	...	...	℥ii.
	Ung. hydrarg. fort.	...	...	...	℥i.
	Creosoti	...	...	...	℥ii.
	Sulphuris subl.	...	...	...	℥i.
	Adipis	...	...	...	℥iv.
	Vaselin.	...	...	...	℥iv.

M. F. ung.

The vesico-pustular eruption on the under surface of the flap and internal lining of the middle ear, causing what is generally termed canker, is moderated by dusting the affected surface with dry zinc oxide; this forms a scab, which ultimately

becomes detached, leaving a healthy dry surface. As a rule, no other treatment is necessary.

During the course of distemper, and especially in the convalescent stage, exposure to cold, exercise, and improper diet, should be specially avoided. A guarded prognosis should always be given at all stages of this disease.

SECTION II

THE TREATMENT OF CANINE TYPHUS

Canine typhus—also known in this country as contagious or epizoötic gastro-enteritis, canine influenza, and by the Germans, abdominal typhus, or *Stuttgarter Hundeseuche*, and by the French, *gastro-entérite hémorragique*, or *pasteurellose canine*—although not a ‘new dog disease,’ as denominated by some authorities, has during the last eight years attracted a great deal of attention, not only in the United Kingdom, but also in many European countries, notably Germany, France, Austria, and Italy.

It is a disease that occurs periodically, especially during wet, chilly, or changeable weather, but seems to disappear as soon as dry or frosty weather sets in.

Although it is seen chiefly during the autumn, winter, and spring months, it may be encountered at any time of the year if the weather is favourable for its development.

Notwithstanding the fact of several dogs in a house, or two dogs belonging to different owners living next door to one another, becoming affected at the same time, there is very little, if any, evidence from the general history of the disease that it is conveyed by direct contagion. As a rule, when the affection makes its appearance in a district, the cases encountered are scattered about in different parts of it.

It may occur in dogs of any age, but is generally seen in adult or aged animals.

Its mortality is very high. Some have placed it as much as 80 or even 90 per cent. However, one is not inclined to accept this estimate of its death-rate. It would, no doubt,

be correct if those cases showing intense gastritis, with gangrenous lesions of the mucous membrane of cheeks, gums, or occasionally the tongue, were only included under this disease. On the contrary, there is a great number of mild or atypical cases, not always recognised as belonging to this disease, that recover, and which should be taken into account when preparing statistics.

Relapses are common, and *second attacks* within a year or after several years, even in dogs that have lost a portion of the tongue at the first seizure, are not rare.

The *course of typhus* varies from a few days to a month, or more. Its invasion in chronic cases is frequently insidious and deceptive.

It is generally considered to be a different disease to canine distemper (Fr. *maladie des chiens*, Ger. *Hundestaupe*), both etiologically and clinically. This is apparently true if only some of the clinical types or isolated outbreaks of that disease are compared with typical cases of typhus. But in some outbreaks of canine distemper in large kennels of young dogs we may find the majority of the cases showing the typical symptoms of distemper, while the remainder present many of the features of typhus. Moreover, one witnesses sometimes a newly-purchased puppy developing the characteristic erupto-catarrhal form of distemper, which gives to the adult or perhaps aged canine inmate in the same house a disease having all the clinical characters of typhus and indistinguishable from it.

In many of its later developments typhus also somewhat resembles malignant jaundice and uræmia.

It may be peracute, acute, chronic, or mild in form.

Mild Form.

In this form the following symptoms are observed: The dog may be somewhat dull; he has shivering fits and little or no appetite, and perhaps an increased thirst. After a time he vomits everything he takes, and also any food or medicine which is forced upon him. In a few days

a slight gangrenous ulceration of the buccal mucous membrane appears, especially over that part which comes in contact with the canine, carnassial, and perhaps the upper and lower incisor teeth. Frequently, however, this latter change is absent. In some cases the only symptoms present are an increased thirst, and perhaps frequent passage of urine. In most instances there is at first a slight diarrhoea. Under rational treatment recovery takes place in two or three days.

Chronic Form.

Although it is said to be an acute and rapidly fatal disease, close observations made upon a great number of cases seem somewhat to negative this assertion. The writer has often encountered dogs that have manifested rheumatic symptoms, which, under appropriate treatment, have passed away, to be soon followed by increased desire for water, diminished appetite, and gradual wasting for some time; and, in spite of this, the animals have not appeared to be much distressed, nor have they a sad facial expression. Rather the opposite has been noticed—brightness of countenance. They have after a time begun to show lassitude, a desire for warmth, and are observed to micturate frequently. This may go on for two or three weeks, when vomiting sets in, and the emaciation and weakness progress rapidly. Two or three days from the commencement of these latter symptoms the mouth almost suddenly gives off a very offensive odour, resembling somewhat that of a cesspool or bad ensilage. (This odour is also encountered in the oral complications of canine distemper.) The suddenness of this symptom is so well marked that on inspection of the mouth the day before the appearance of lesions, perhaps, beyond a little dirty greyish or brownish slime on the buccal mucous membrane and teeth, no lesions have been noticed.

On inspection of the mouth, the buccal and oral mucous membrane—especially those portions coming in contact with the carnassial, canine, and incisor teeth, upper and lower—and sometimes the anterior portion or tip of the tongue, are

found blackish or greenish in appearance, cold and insensitive to touch, and giving off the nauseating odour mentioned above. After a few hours this blackish or greenish appearance changes in colour to that of a greyish-green or straw-colour, and a gangrenous slough appears, that seems attempting to separate itself from the healthy or living membrane. Complete separation of the necrotic parts takes place in a day or two, and if the animal survive, there is left a reddish or greyish-red granular surface. Very often this process when attacking the gums round the neck of the teeth also extends to the alveolar processes and a portion of bone surrounding them, which, with the neck of the teeth, are left exposed.

If the vomiting continues and the rejected material is of a coffee-coloured or brownish-red appearance, and gives off a putrid odour; and if, also, there be a convulsive action of the temporal and masseter muscles (simulating that seen in strychnine-poisoning), sometimes causing a short, sharp convulsive opening and shutting of the jaws, death will certainly take place in a very short time.

Acute Form.

In this form, which rages in certain districts or at certain periods, there are fits of shivering, and in some instances a great desire for warmth; loss of appetite, which quickly becomes absolute; dulness; no desire to move, but when made to walk there is a short tottering gait, with a slight arching of the loins; the whole of the body seems stiff, the expression becomes anxious, and after a time there is great depression.

The bowels at first remain in abeyance, but after a few days there is a frequent passage of a gelatinous material containing blood, accompanied with much straining.

After two or three days vomiting sets in, and is continued at short intervals, especially if water is frequently taken or nourishment forced upon the animal. At first the vomit contains particles of food mingled with mucus, and as emesis continues it soon becomes of a glairy, ropy, clear-

looking material, streaked here and there with air-bubbles, giving it a frothy appearance. After a time this is replaced by a thin, greenish, watery liquid, and ultimately a dirty prune-juice or brownish coffee-coloured material, which gives off a putrid, nauseating odour.

If the vomiting be severe there is a great desire for water ; this is rejected almost as soon as swallowed.

In some instances the conjunctival mucous membrane is of a dirty purplish colour ; in others it has a dirty pale yellow tint, or a bright red appearance, with the sclero-conjunctival bloodvessels standing out prominently.

On inspection of the mouth, we may find a stringy mucus, tinged with blood or a brownish material, hanging from its angles, and the muzzle may present a swollen appearance ; there may be a thick layer of dirty or brownish mucus adhering to the buccal and labial membrane, gums, teeth, tongue, soft palate, and pharynx, or the teeth only may be covered with a reddish or brownish-coloured material towards the later stage of the complaint. Those portions of mucous membrane of the cheeks and lips that come in contact with the surface of the teeth, and in many instances (especially during certain seasons) the tip of the tongue, also become affected, as in the later stage of the chronic form.

The base of the tongue, tonsils, pillar of the fauces, soft palate and pharynx have often a dark, turgescient appearance, due to the congestion or dilatation of the minute bloodvessels, and are not rarely covered with a gangrenous or purulent diphtheroid material. In this state, if food be forced upon the animal, or if the pharyngeal region be pressed, spasm of the œsophagus may be sometimes observed. In many of these cases, and more especially where the mouth and pharynx are not cleansed and dressed with an antiseptic, a rapidly fatal pneumonia supervenes.

In slighter cases, where the thirst, vomiting, and diarrhœa are not severe, an improvement may take place as soon as the necrotic patches in the mouth have separated themselves from the living tissues, which may occur in two or three days. However, not infrequently such early recoveries as these

are liable to an almost sudden relapse, and end in death in a few hours.

Many of the cases that recover do so after having suffered a total loss of appetite for weeks.

Peracute Form.

This is the most fatal of all the clinical forms of this disease. The animal is suddenly seized with an unaccountable vomiting, or perhaps has passed some almost pure blood *per anum*, although an hour or two before this food was eagerly taken, or he was playing about or hunting as usual. Many cases have occurred where the animal was all right before going to bed, but during the night has disturbed its owner in consequence of the vomiting or crying or passing a bloody diarrhœic material, or, where it has not slept in the owner's room, has been found in the morning in a drowsy, cold, and miserable state.

Usually such a state of affairs is by the owner attributed to either malicious or accidental poisoning.

There is great depression; the animal appears in a dazed state, and does not care to move; the ears, mouth, and feet are icy cold; there is a dirty saliva issuing from the mouth, and the skin is not very contractile when the grip has become loosened. When he gets up for water he loses the dazed appearance, and laps up the fluid with avidity, but rejects it immediately. The stools are often bloody and fœtid.

The abdomen, as in all other forms, is tucked up, and in a good many instances the animal moans when it is manipulated, especially over the region of the stomach, which not rarely brings on vomiting.

After twelve to twenty-four hours have elapsed from the onset of the illness, symptoms of coma, preceded or not with peculiar clonic convulsions, set in, and death takes place without a struggle. In other cases the animal dies during an effort of vomiting or retching.

If the animal lingers two or three days longer, similar conditions of the mouth to those in the preceding forms are observed.

Internal Temperature.—There is no doubt, if one could observe every case of typhus from the commencement of its initial stage, one would find the thermometer raised to 1° , 2° , or 3° above the normal.* As it is, when the animal is brought for inspection during the early stage, one often observes the temperature elevated to 103° to 105° F. However, as soon as general intoxication sets in, it goes down to the normal, and even the subnormal— 98° to 95° F., which is maintained until death or a reaction (followed by recovery) takes place.

The Urine.—Although in some of the mild cases, and also in the earlier stage of the chronic form, when there is no vomiting (or before this has set in), the urinary secretion does not appear to be diminished in amount, very little urine is secreted, or rather filtered, through the kidneys during typhus. In many instances it seems as if this function remains in abeyance. What little is passed or drawn off by the catheter has a clear yellowish or golden-reddish tint, or it may be quite turbid in appearance. It generally contains albumin, and often bile salts, epithelial cells, urinary casts, white corpuscles, and blood cells. It is acid in reaction.

An important fact should not be overlooked—viz., this disease (typhus) oftener occurs in aged dogs which are very commonly and unsuspectingly affected with senile or chronic interstitial nephritis independent of typhus, so that it does not necessarily follow that because albumin, casts, etc., appear in the urine, they are due to typhus. However, like distemper or other infective processes, it frequently gives rise to catarrhal or even parenchymatous nephritis.

The diminution or seeming suppression of urine is to be chiefly accounted for by the immediate vomiting of all fluids as soon as ingested.

It may be well to mention that many of the later features of uræmic poisoning, brought about by obstruction to the

* The normal temperature of the dog ranges between 100° F. and 102.6° F., and averages in a large number of cases about 101.5° F. I have seen it stated that 103° F. is a normal temperature when the dog is submitted to excitement. This has not been my experience.

exit of urine from the bladder in consequence of urethral calculi, are common to those seen in the later stage of typhus.

Muscular and Nervous Phenomena.—The muscular and nervous phenomena as seen sometimes in typhus are not peculiar to that disease, as they may be seen in ptomaine-poisoning, in many septic conditions following enteritis or gastritis due to foreign bodies, and in the typhoid state occurring late in distemper, etc. They may consist of vertigo, tetanic convulsions resembling those of strychnine, and also the eclamptic fits of suckling bitches. The muscular twitchings may be confined to the head, jaws, shoulders, hind-quarters, or diaphragm, or they may extend all over the body. When those of the jaws are affected, the temples throb, the jaws are opened and shut suddenly in a snatching, jerky manner, and there is chattering of the teeth. When the limbs are affected there is a rigidity, alternating with a jerky relaxation. These convulsions, like those of strychnine-poisoning, are increased by touching the body. At times there are writhings or tremors of certain muscles. Sometimes there is a general weakness of the hind-quarters simulating paraplegia.

Gastric and Cutaneous Phenomena.—The *gangrenous condition* is not always confined to the mouth; it may occur on the skin where there is pressure, or in the rectum or around the anus.

Intense gastritis may be present, with very little vomiting and thirst; or intense vomiting and great thirst may have existed without very severe or any gastric lesions being discernible to the naked eye on post-mortem examination. The gastric secretion in this disease is always alkaline.

As in distemper, long-coated dogs have after convalescence from typhus very often shedding of the hairy covering of the body.

The **prognosis** is always grave. When the vomit is putrid, or when the gangrenous state of the mouth sets in late in the complaint, or when there is rapid wasting, coma, prolonged subnormal temperature, and twitchings of any of the various groups of muscles, death is certain to follow. Typhus

generally runs its course in a few hours to a fortnight. The longer the animal lives, the better the chances of its recovery become. Recovery is anticipated when the vomiting has ceased, and the stomach can bear liquid nourishment, and also when the bowels regain their natural function. As a rule, in these cases the buccal lesions, if occurring early in the disease, throw off their necrosed portions, and commence to heal very rapidly.

Treatment.

As soon as we suspect typhus from the dulness, stiffened gait, tired appearance, and perhaps vomiting, with or without other appreciable symptoms, and from the fact that similar cases have been encountered in the same district, we should at once enjoin abstinence from exercise and from exposure to the open air. The affected animals should be kept warm and quiet.

If we are fortunate enough to get the cases brought to us in their early stage, we may do a great deal to lessen the virulence of the virus when circulating in the blood, and before the secondary infections arising from the mouth and intestine take place, which give rise to the oral, gastric, and intestinal lesions.

To obtain a mitigating effect, I have used quinine *subcutaneously* with very good results. The following formula is very suitable:

R Quininæ hydrochloridi acidi grs. ii.
 Aquæ destillatæ ... ℥ xxiv.

Of this, 6 to 24 minims are to be injected three times a day.

The only objection to the hypodermic injection of quinine in the dog is its liability to cause an abscess, especially if the material is not aseptic or not injected deep enough. It should be injected into the muscles.

If it is deemed advisable to administer the drug in the form of mixture, the following may be substituted:

R Quininæ sulphatis ... grs. xxiv.
 Acidi hydrochlorici ... ℥ xxiv.
 Aquæ chloroformi ... ad ̄vi.

F. m.

Of this, a tea, dessert, or table spoonful should be given every four hours.

When there are acute rheumatic pains, we prescribe, instead of either of the above, the following powder, which may be dropped on the tongue three times a day :

R	Quininæ salicylatis ...	...	grs. ii
	Sodii salicylatis ...	...	grs. viii.
	M. F. pulv. i.		

However, as a rule our attention is not called to animals when suffering from this disease until their owners have become alarmed at the symptoms manifested, such as repeated vomiting, absolute loss of appetite, and great thirst. We have then to do with gastritis or enteritis, or both combined.

When there is repeated vomiting—which may not necessarily be due to gastritis, but sometimes to cerebral intoxication—the bismuth salts and other gastric sedatives so valuable in simple gastritis or gastro-enteric catarrh are worthless here. I know they are highly recommended by various writers, who seem to have reasoned from analogy rather than from the actual facts on this subject; but nevertheless in my hands they have proved of no value.

As pointed out in the symptomatology, the gastric secretion, as indicated by the vomit in this disease, is alkaline, whereas in the normal health of the dog it is strongly acid—a condition unfavourable for the majority of pathogenic and saprophytic micro-organisms.

It is a well-known fact that many animals under natural conditions are refractory to certain infections; but when the normal acid condition of their stomachs is overcome by neutralising it with alkalies, infection readily takes place.

Therefore, in this disease, as the normal acid gastric juice has become replaced by an alkaline secretion, is it not reasonable to suppose that the normal saprophytic microbes of the alimentary canal, having the opportunity, take it to invade the deeper layers of the gastric mucous membrane, and set up inflammatory, and very often ultimately gangrenous, changes and general septic intoxication ?

To acidify the gastric secretion with the object of destroying, or at least modifying, the injurious action of the micro-organisms contained in that viscus, I have utilised hydrochloric acid, $\frac{1}{2}$ drachm to 8 ounces of water, given in tea, dessert, or table spoonful doses every four hours; and when this treatment has been adopted before any structural changes in the alimentary canal have taken place, I have had very favourable results.*

I was induced to try this treatment in consequence of the success I had with it in cleansing dogs' teeth and mouths when suffering from 'foul breath.' Although tartar on the teeth is often, but not always, associated with 'foul breath,' I noticed, in using water acidulated with hydrochloric acid as a mouth-wash to assist in removing the tartar, that it not only did away with the offensive odour, but that the animals improved in appetite and in condition. I could not attribute these results to the removal of tartar, as many dogs have tartar and no 'foul breath,' whereas, on the other hand, many dogs have 'foul breath' and no tartar on the teeth.

However, once structural changes of the gastric mucous membrane, or, for that matter, the alimentary canal, have taken place, slight stimulating antiseptics or disinfectants are of use in modifying the diseased tissues and their products.

The mouth and teeth, and perhaps also the stomach and intestine, may be washed out a few times with a $\frac{1}{2}$ to 1 per cent. solution of permanganate of potassium, a 7 per 1,000 solution of sodium chloride, or a 2 per cent. solution of hydrogen peroxide.

If there be much gastric pain, cocaine hydrochloride ($\frac{1}{4}$ to $\frac{1}{2}$ grain), or chloretone (5 to 10 grains) in tabloids or tablets given by the mouth, or morphine hydrochloride ($\frac{1}{8}$ to $\frac{1}{4}$ grain) subcutaneously, or a mustard-plaster or leeches applied over the region of the stomach every four hours, may prove of service, not only in alleviating the pain, but also the distressing vomiting.

Stimulants, although injurious in simple gastritis, are very

* *Vide Veterinary Record*, pp. 539, 540, vol. xi., 1898-1899.

useful here. They may be given in the form of pure and mature brandy (Martell's or Hennessy's * * * brands are the best for this purpose), either injected under the skin or administered by the mouth in $\frac{1}{2}$ to 2 drachm doses every four hours. Or the British Pharmacopœia compound tincture of cinchona in similar doses may be used for a like purpose.

Where the shock, evidenced by the dazed appearance, cold extremities, subnormal temperature, infrequent and slow pulse, is profound, subcutaneous transfusions or rectal injections of the normal saline solution (sodium chloride, 7 ; aqua, 1,000), raised to a temperature of 105° to 106° F., may be tried, as also the hot-water bottle and hypodermic injection of strychnine, ether, caffein, digitalis, etc.

If such bland and easily-digested nutrients as Brand's Essence of Beef (jelly), Plasmon, barley-water, etc., cannot be supported by the stomach, peptonised milk, containing 7 to 1,000 common salt, meat suppositories, etc., injected or inserted up the rectum, may be tried. Boas recommends the following nutrient enema where the stomach cannot support any nourishment :

Yolk of two eggs.	
Milk	250 grammes.
Common salt	1 teaspoonful.
Red wine	1 tablespoonful.

Even if these means of giving nourishment fail, the subcutaneous method of administering normal saline solution, sterilised milk diluted to half with water (the whole containing 1 drachm of common salt to the pint), or defibrinated blood obtained from a healthy dog, should be adopted in the case of valuable animals or very great pets.

Whatever is administered in the shape of food, it should be in the smallest quantity, and repeated as often as is deemed advisable. If too large a quantity is given at one time it is likely to be rejected at once, whereas a small quantity would probably be retained.

If the thirst be great, ice broken into small pieces and pushed down the back of the mouth, citrated water, lemon-juice, aerated soda-water in small and repeated quantities,

or the subcutaneous transfusion of boiled water, may appease the animal's cravings.

After the acute symptoms have abated—*e.g.*, no vomiting for at least thirty-six hours—and the animal begins to wander about as if seeking for food, a tea, dessert, or table spoonful (according to the size of dog) of *scraped* raw beef should be offered, and if taken and retained a similar quantity should be allowed every four hours for at least twenty-four hours, and then, if well supported, increased from day to day. The compound solution of bismuth, containing nux vomica and pepsin, is useful in this stage of the complaint.

When there are any gangrenous ulcers inside the cheeks, lips, on the gum surrounding the teeth, or gangrene of the tip of the tongue, the sloughs should be encouraged by painting the surrounding living tissues with the glycerin or tincture of iodine, nitrate of silver, chloride of zinc, etc. As soon as the dead parts become loose they should be removed, and the remaining ulcerated surface dressed with tincture of iodine, peroxide of hydrogen, etc.

When there are any loosened teeth they should be removed, and if the bone surrounding the alveoli be exposed and necrotic, it should be mopped with dilute hydrochloric acid, and allowed to exfoliate. It is not advisable to surgically remove it, as general infection is likely to ensue, causing great suffering, if not death. If the animal survives it will soon exfoliate of itself.

Hygienic and dietetic precautions should be observed for some time after the dog has apparently recovered from typhus, as a too speedy return to his normal diet, too much food given at one time, or exposure to chill, fatiguing exercise, etc., are far too common causes in bringing about fatal relapses from an apparent recovery of a mild attack of this malignant disease.

CHAPTER XX

THE TREATMENT OF SARCOPTIC MANGE IN HORSES AND MULES *

BEFORE animals are dressed in any way an accurate diagnosis should, if possible, be made as to the nature of the skin disease from which they are suffering. This can only be done in cases of mange by discovering the parasite under the microscope. Many practitioners have found great difficulty in demonstrating the acari in cases of mange, especially in sarcoptic mange. The secret of success in such cases is: obtaining débris by scraping suitable areas of the skin, and soaking this in liquor potassæ for at least three hours before searching for parasites. In sarcoptic mange scrapings should be made down to the true skin; in psoroptic and synbiotic mange more superficial scrapings are sufficient.

1. The affected animals should be closely clipped, the hair on the legs as well as that on the body being removed, and the manes hogged. This should be done in a loose-box, and all the hair carefully collected and burnt. The patients should now be dressed all over with—

Sulphur	...	...	...	1 part.
Lard, vaseline, train-oil, or				
fish-oil	...	...	...	4 parts.

The following day the horse's skin will, if this mixture has been properly applied, present a uniform yellow colour. The patient should now be lunged daily until the skin acts, and then the dressing should be well rubbed in with the hand.

* This chapter has been written by Lieut.-Colonel Blenkinsop, D.S.O., A.V.D.

2. On the sixth day the animal should be thoroughly dressed with the following mixture :

Paraffin or kerosene-oil	...	$\frac{1}{2}$ to 1 pint.
Soap solution ...	...	1 gallon.

This preparation is made by adding 1 pound soft-soap or Sunlight soap to 1 gallon warm water, and simmering over a slow fire until the soap is dissolved ; then remove from the fire, add the kerosene-oil, and stir until the oil mixes thoroughly with the soap solution and the whole becomes of a creamy consistency.

3. On the seventh day wash thoroughly with plenty of warm water, in order to remove the whole of the sulphur dressing. While this is being done the box or stall should be thoroughly disinfected with a powerful blow-lamp flame—the floor, walls, manger, etc., being all most carefully flamed. The most useful lamp for this purpose is a brazier's lamp, giving a 12-inch flame and holding about 1 quart of petroleum. During the time the animals are under treatment no bedding should be allowed.

4. On the eighth day the sulphur dressing should be reapplied and the former treatment continued. On the thirteenth day the kerosene-oil emulsion should be applied, and the patient thoroughly washed on the fourteenth day, when the stable should be again thoroughly disinfected with the blow-lamp.

Treatment for three weeks or three separate courses of dressing will almost invariably result in a radical cure, but it is absolutely necessary for success that everything should be carried out in a most thorough and systematic manner.

It is advisable to thoroughly examine the patient's skin, after each washing with warm water, for papulæ or small petechial spots. If these are present the affected areas should be thoroughly scraped with a sharp scalpel down to the true skin, and the material thus obtained should be mixed with liquor potassæ for some three or four hours and then examined under a 1-inch objective for parasites or their eggs.

It is necessary to bear in mind that the kerosene-oil emul-

sion frequently causes a certain amount of irritation, which in many cases may be mistaken for that resulting from the presence of parasites, and it consequently should not be considered as positive evidence that these are present. Every endeavour should be made to arrive at an accurate decision after a careful microscopical examination and consideration of clinical symptoms.

5. After the third dressing the patients should be placed under observation for at least three weeks, and should be looked upon with suspicion for three months. In rare instances it may be necessary to repeat the treatment, but this is generally only necessary when either the first course of treatment has not been thoroughly carried out or the animal has become reinfected.

6. Horse-rugs, attendants' clothes and hands, brushes, harness, shafts and poles of carts, stables, etc., transmit the parasite, and require careful attention. Clothing, blankets, numnahs, etc., should be passed through the disinfecting chamber of the nearest hospital or infirmary. Soap and water is the best means of cleaning the men's hands. Grooming brushes and curry-combs and horse-clippers should be dipped in kerosene-oil immediately after use. The kerosene-oil and soap emulsion, if made with soft-soap and of the strength of 1 pint kerosene-oil to 2 quarts soap solution, is very convenient for dressing the leather-work of harness, head-stalls, etc.

7. Men attending horses affected with sarcoptic mange should not be allowed to go near clean horses, nor should they be allowed to mix with men attending healthy animals. In barracks it is most desirable to keep the men isolated and place them in separate barrack-rooms. Frequently horses which have been cured are reinfected owing to want of care on the part of the attendants, and this is often the cause of the disease being difficult to eradicate from a stud.

8. Care should be taken to prevent dressed horses standing in the direct rays of the sun, as their skins are very easily blistered.

Animals isolated for observation after apparent cure should

not be dressed in any way unless they again show symptoms of mange, when they should be treated as fresh cases of the disease.

Special attention should be paid to the diet and grooming of horses which have been recently under treatment for mange. Animals should be liberally fed on easily digested food, both while under treatment and for some time after they have been cured. When procurable, green forage should be given, and, if possible, animals should be grazed for several hours daily. In the winter the frequent administration of small doses of sulphate of magnesia will be found most beneficial.

9. Horses which have been in contact with others suffering from mange should be thoroughly dressed with the kerosene-oil emulsion (paragraph 2). This should be washed off on the following day with warm water, and the treatment repeated after a week's interval. The following has been found a very useful and reliable dressing for in-contact animals, although it has not been successful in curing horses exhibiting clinical symptoms of sarcoptic mange :

Caustic lime	...	...	1 pound.
Sulphur	...	...	$\frac{1}{2}$ pound.
Water	...	...	1 quart.

Mix the lime and water in a clean saucepan, add the sulphur, and stir until the mixture is of a uniform grey colour. Now simmer over a slow fire, keeping the mixture constantly stirred, until it turns a deep orange colour and smells strongly of H_2S . Remove from the fire and allow the sediment to settle, decant the clear orange-coloured fluid into a clean vessel, from which filter it through blotting-paper into bottles, which should then be kept well corked. Care should be taken that the fluid in these bottles is free from sediment. A pint of this liquid is sufficient to dress two horses. It should be thoroughly groomed off on the fourth day and reapplied the following morning.

10. Success in the eradication of mange from a stud depends on the intelligence and care employed in carrying out the treatment of affected and in-contact animals. It will

be found economical both in time and money to work in a thorough and systematic manner as soon as the disease has been accurately diagnosed; otherwise treatment is almost sure to result in failure.

11. If mange breaks out amongst the horses of an army in the field all the horses should be dressed, if possible, once a fortnight as a precautionary measure. The dressing used will depend largely on local conditions, but dressings containing kerosene-oil or calcium sulphide are recommended.

Treatment of Psoroptic and Symbiotic Mange.

Psoroptic and symbiotic mange are quickly cured by two or three dressings of the kerosene-oil emulsion or the dressing described in paragraph 9. The bedding in these cases should be burnt, and at the time the dressing is applied the stable should be thoroughly disinfected with the blow-lamp. In the case of psoroptic mange, harness, etc., should be treated as recommended in paragraph 6.

When dealing with parasitic mange in horses the practitioner should bear in mind that too energetic treatment, or the too frequent use of irritant dressings, often produces symptoms which closely resemble those set up by the psoroptic parasite, and frequently this irritation is mistaken for the disease long after the parasite has disappeared.

Treatment of Sarcoptic Mange in Camels.

1. Isolate infected animals at once, together with their saddles, grooming kit, etc.

2. Clip the animals and, if possible, wash thoroughly with warm water and soap. When dry apply the following dressing :

Train-oil	2 pounds	} Sufficient to dress one camel.
Sulphur	...	...	...	$\frac{1}{2}$ pound
Salt	...	...	...	$\frac{1}{2}$ pound

This should be removed on the third day, either with warm water and soap or by applying the paraffin emulsion mentioned in paragraph 2 of the Treatment of Sarcoptic Mange in Horses, and washing with warm water on the fourth day.

Three successive dressings usually effect a cure, but every precaution should be taken, as in the case of horses, to prevent reinfection by grooming kit, attendants' clothes, saddles, etc.

3. In tropical climates camels should never be treated with oleaginous dressings in the morning, as the sun, acting on the oil, is very liable to blister the skin.

4. When near the sea, mange in camels has been successfully treated by making the animals lie in the sea-water and rubbing them over with coral. Three or four baths usually prove effective, but it is always advisable to dress the animals at least once with oil and sulphur before discharging them as cured.

5. In India taramira-oil or chira pine-oil will be found a most reliable dressing.

6. Paraffin or kerosene-oil may be used, but it is very liable to blister the patients. This danger of blistering can be overcome by first dressing the camels all over with a weak solution of Jeyes' Fluid, and while they are still wet applying the kerosene-oil from a bottle through the cork of which an ordinary quill has been inserted. The oil is spread evenly over the surface with a grooming brush.

7. After the animals are considered cured they should be kept for at least a fortnight or three weeks under observation before they are again allowed to mix with clean animals, and during this time they should be groomed, but not dressed in any way for mange.

8. Saddles, line gear, etc., are a fruitful source of spreading mange, and should be treated as far as possible as recommended in paragraph 6 of Treatment of Sarcptic Mange in Horses.

9. Camel-lines on which infected animals have been standing should be covered with dry grass or brushwood, which should then be burnt.

10. As a precautionary measure to prevent introduction of mange, camels should be thoroughly dressed with the sulphur dressing immediately after purchase and before they are allowed to mix with other camels.

THE TREATMENT OF RINGWORM IN THE HORSE.

For clinical purposes ringworm may be divided into two varieties—viz., (1) localised, (2) diffused.

In the localised form the most effectual treatment is to remove the scales with a spatula and to touch the spot with the tip of the finger, which has been dipped in ordinary kerosene-oil. In the diffused form of the disease—*i.e.*, when the spots of the localised form are spread over the body—one or two dressings of the following liniment will usually prove successful :

Kerosene-oil	...	...	2 parts.
Linseed-oil	...	...	1 part.
Soft-soap solution	...	...	2 parts.

Mix the two oils, and then add the solution of soap, stirring well. The soap solution is prepared by dissolving $\frac{1}{2}$ pound of soft-soap in 1 gallon of warm water.

If necessary, the horse should be clipped before the dressing is applied. The bedding should be burnt, and the harness, rugs, etc., disinfected. Special attention should be given to the grooming kit. The brushes are quickly disinfected by dipping them in kerosene-oil. The saddles and girths, especially the latter, are the most fruitful cause of the spread of ringworm, particularly in dealers' stables. When the same saddles have to be used on several horses an ordinary stable rubber should be kept for each horse; this is to be placed in a single layer under his saddle. If ringworm is prevalent in the stables this rubber should either be ironed daily with an ordinary hot flat-iron, or wrung out of a 1 in 500 solution of corrosive sublimate. The girths should also be disinfected with a similar solution.

APPENDIX

FORMULÆ

ALTERATIVES.

For Horses.

ALTERATIVE MIXTURES.

- No. 1. R Hydrarg. biniod. ̄i.
 Potassii iod. ̄i.
 Aquæ ad ̄xii.
 F. m. Sig. : Give half a wineglassful three times daily in
 the food.
- No. 2. R Liq. arsenicalis ̄x.
 Ferri carb. sacch. ̄iv.
 Tinct. gent. co. ̄v.
 Aquæ ad O.i.
 F. m. Sig. : Give a wineglassful twice daily in the food.

POWDERS.

- No. 1. R Sulphuris sub. ̄iii.
 Antim. potass. tart. ̄i.ss.
 Sodii bicarb. ̄iv.
 Pulv. anisi ̄iii.
 M. Div. in pulv. xii. Sig. : Give one twice daily in
 the food.
- No. 2. R Acidi arseniosi ̄i.
 Ferri sulph. exsicc. ̄i.ss.
 Sodii bicarb. ̄iv.
 Pulv. carui sem. ̄iii.
 M. Div. in pulv. xii. Sig. : Give one twice daily in
 the food.

No. 3.	R Magnesii sulph.	...	...	̄vi.
	Sulphuris sub.	...	...	̄ii.
	Sodii bicarb.	...	...	̄ii.

M. Div. in pulv. vi. Sig.: Give one twice daily in the food.

ALTERATIVE BALLS.

R Acidi arseniosi	...	...	̄i.
Ferri sulph. exsicc.	...	...	̄i.ss.
Pulv. gentianæ	...	...	̄iii.
Sodii bicarb.	...	...	̄iii.
Saponis mollis	...	...	q.s.

M. Div. in bol. xii. Sig.: Give one twice daily.

For Cattle.

ALTERATIVE POWDERS.

R Magnesii sulph.	...	...	̄xii.
Sulphuris sub.	...	...	̄vi.
Sodii bicarb.	...	...	̄vi.
Ferri sulph. exsicc.	...	...	̄ii.
Pulv. carui sem.	...	...	̄iv.

M. Div. in pulv. vi. Sig.: Give one twice daily in the food.

For Dogs.

ALTERATIVE MIXTURES.

No. 1.	R Liq. arsenicalis	...	...	̄i.
	Syr. aurantii	...	...	̄i.ss.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful (according to the size of dog) three times daily.

No. 2.	R Liq. arsenii et hydrargyri iodidi	...	...	̄ii.
	Syr. aurantii	...	...	̄ii.
	Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from a teaspoonful to a tablespoonful twice daily.

ALTERATIVE PILLS.

No. 1.	R Acidi arseniosi	...	...	gr. $\frac{1}{60}$ to gr. $\frac{1}{20}$.
	Sulphuris præcip.	...	...	grs. v. to grs. x.
	Sodii bicarb.	...	...	grs. v. to grs. x.
	Ext. gentianæ	...	...	q.s.

M. F. pil. i. Mitte xii. Sig.: Give one twice daily.

No. 2.	R Acidi arseniosi	...	...	gr. $\frac{1}{50}$.
	Ferri sulph. exsicc.	...	...	gr. i.
	Calcii sulphidi	...	...	gr. $\frac{1}{4}$.
	Ext. gentianæ	...	...	q.s.

M. F. pil. i. Mitte xii. Sig.: Give from one to two pills three times daily.

No. 3. (*Useful in Chronic Rheumatism.*)

R Guaiaci resinæ	...	...	grs. iii.
Sulphuris præcip.	...	...	grs. iii.
Ext. gentianæ	...	...	q.s.

M. F. pil. i. Mitte xii. Sig.: Give from one to four pills three times daily.

ALTERATIVE POWDERS.

No. 1.	R Acidi arseniosi	...	...	gr. $\frac{1}{30}$ to gr. $\frac{1}{20}$.
	Magnesii sulph.	...	...	grs. x. to grs. xx.
	Sodii bicarb.	...	...	grs. v. to grs. x.

M. F. pulv. i. Mitte xii. Sig.: Give one twice daily in the food.

No. 2.	R Sulphuris præcip.	...	...	grs. v. to grs. x.
	Sodii bicarb.	...	...	grs. v. to grs. x.
	Magnesii sulph.	...	...	grs. x. to grs. xx.

M. F. pulv. i. Mitte xii. Sig.: Give one twice daily in the food.

No. 3.	R Sulphuris præcip.	...	...	grs. v. to grs. x.
	Potassii tartratis acidi	...	...	gr. i. to grs. iii.

M. F. pulv. i. Mitte xii. Sig.: Give one twice daily in the food.

ANODYNES.

For Horses.

ANODYNE DRENCHES OR DRAUGHTS.

No. 1. (*Advised for Spasmodic Colic.*)

R Chloral hyd. ʒi.
 Mucilaginis ʒiv.
 Aquæ ad O.i.

M. F. haust. Sig. : Give at once. Repeat in two hours
 if necessary.

No. 2. R Tinct. chloroformi et mor-
 phinæ co. ʒss. to ʒi.
 Spts. æth. nit. ʒii.
 Ol. lini O.i.

M. F. haust. Sig. : Give at once.

No. 3. R Tinct. opii ʒii.
 Spts. æth. nit. ʒii.
 Ol. menth. pip. ʒi.
 Ol. lini O.i.

M. F. haust. Sig. : Give at once.

For Enteritis, Peritonitis, etc.

No. 4. R Chloral hyd. ʒi.
 Morphinae hydrochlor. ... grs. iv.
 Mucilaginis ʒiv.
 Aquæ ad O.i.

M. F. haust. Sig. : Give at once. Repeat in two hours,
 or as required.

Or :

No. 5. R Ext. cannabis indicae fl.
 (standardised) ʒss. to ʒi.
 Glycerini ʒii.
 Aquæ ad O.i.

M. F. haust. Sig. : Give at once.

Or:

- No. 6. R Chloral hyd. $\bar{5}$ ss.
 Ext. cannabis indicæ fl. ... $\bar{5}$ ss.
 Mucilaginis $\bar{5}$ iv.
 Aquæ ad O.i.
 M. F. haust. Sig. : Give at once.

ANODYNE BALLS.

- No. 1. R Chloral hyd. $\bar{5}$ i.
 Excipient. q.s.
 F. bol. i. Sig. : Give at once. Repeat in two hours if
 necessary.

For Enteritis.

- No. 2. R Pulv. opii $\bar{5}$ i. to $\bar{5}$ ii.
 Pulv. camphoræ $\bar{5}$ i.
 Ext. belladonnæ vir. ... $\bar{5}$ ii. to $\bar{5}$ iv.
 Excipient. q.s.
 F. bol. i. Sig. : Give at once. Repeat in four or six
 hours as required.
- No. 3. R Ext. cannabis indicæ ... $\bar{5}$ ss. to $\bar{5}$ i.
 Excipient. q.s.
 F. bol. i. Sig. : Give at once. Repeat in four to six
 hours if necessary.

Anodynes for Cattle are similar to those advised in the form
 of draughts for the horse.

For Dogs.

ANODYNE MIXTURES.

- No. 1. R Morphinae hydrochlor. ... grs. iii.
 Ext. cannabis indicæ fl. ... ℥ xl.
 Chloroformi ℥ xl.
 Acidi hydrocyanici (B.P.) ... ℥ ix.
 Tinct. capsici ℥ i.ss.
 Ol. menth. pip. ℥ i.ss.
 Aquæ ad $\bar{5}$ i.
 F. m. Sig. : Give from 5 minims to 15 minims in a little
 water, repeated in an hour if necessary.

No. 2.	R	Chloroformi	...	...	...	ʒii.
		Morphinæ acet.	...	...	...	grs. iii.
		Ol. anisi	...	...	...	℥xvi.
		Ol. menth. pip.	...	...	...	℥xvi.
		Mucilaginis	...	...	...	ʒss.
		Aq. camphoræ	...	...	...	ad ʒiv.

F. m. Sig. : Give from 20 minims to 1 drachm, and repeat in three or four hours if required.

No. 3.	R	Liq. opii sed. (Battley)	...	℥v. to ℥x.	
		Ol. menthæ pip.	... ..	℥ss.
		Spts. chloroformi	... ..	℥x. to ℥xx.
		Ol. ricini	... ..	ʒii. to ʒss.
M. F. haust. Sig. : Give at once.					

No. 4.	R	Tinct. belladonnæ	...	...	ʒss.
		Tinct. cardamomi co.	...	...	ʒvi.
		Spts. ammon. aromat.	...	...	ʒii.
		Spts. chloroformi	...	...	ʒii.
		Aq. menth. pip.	...	...	ad ʒvi.

F. m. Sig. : Give from two teaspoonfuls to a tablespoonful every hour until pain is relieved.

ANTIPYRETICS AND FEBRIFUGES.

For Horses.

ANTIPYRETIC MIXTURES.

No. 1.	R	Quininæ sulph.	...	...	ʒv.
		Ac. sulph. dil.	...	...	q.s.
		Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in $\frac{1}{2}$ pint of water.

No. 2.	R	Spts. æth. nit.	...	...	ʒvi.
		Liq. ammon. acet. (concent.)	...	...	ʒx.
		Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in $\frac{1}{2}$ pint of water.

FEBRIFUGE POWDERS.

R	Magnesii sulph.	...	...	̄xii.
	Potassii nit.	...	...	̄ii.

M. Div. in pulv. vi. Sig.: Give one twice a day dissolved in the drinking-water.

ANTIPYRETIC BALLS.

R	Quininæ sulph.	...	...	̄i. to ̄i.ss.
	Ammonii carb.	...	...	̄ii.
	Excipient.	...	...	q.s.

F. bol. i. Mitte vi. Sig.: Give one three times a day.

For Dogs.

ANTIPYRETIC MIXTURES.

No. 1.	R	Phenacetini	...	...	grs. viii.
		Quininæ hydrobrom.	...	...	grs. viii.
		Syr. aurantii	...	...	̄ss.
		Aquæ	...	...	ad ̄iv.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every two hours.

No. 2.	R	Sodii salicylatis	...	...	̄i.
		Syr. aurantii	...	...	̄ss.
		Aquæ	...	...	ad ̄iv.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every two hours.

No. 3.	R	Spts. æth. nit.	...	...	̄vi.
		Liq. ammon. acet.	...	...	̄iii.
		Syr. aurantii	...	...	̄ss.
		Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every three hours.

No. 4.	R	Quininæ sulph.	...	...	grs. xl.
		Ac. sulph. dil.	...	...	q.s.
		Syr. aurantii	...	...	̄i.ss.
		Aquæ	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a tablespoonful every three or four hours.

ANTHELMINTICS.

For Horses.

WORM DRENCH.

R	Ol. terebinth. ...	...	...	℥ii.
	Spts. æth. nit. ...	...	...	℥ii.
	Ol. lini ...	...	...	O.i.

F. m. Sig.: Give at one dose. The horse should be prepared by feeding him on soft food for two days previously.

WORM POWDERS.

R	Antim. potass. tart. ...	...	...	℥i.ss.
	Ferri sulph. exsicc. ...	...	...	℥i.ss.
	Pulv. gentianæ ...	...	...	℥ii.
	Pulv. anisi ..	...	...	℥ii.

M. Div. in pulv. xii. Sig.: Give one twice daily in the food. When all have been taken, administer a worm drench.

For Strongylosis in Foals.

R	Thymol ...	...	...	grs. x. to grs. xv.
	Glycerini ...	...	...	℥ss.
	Spts. rectific. ...	...	...	℥ss.
	Mucilaginis ...	...	...	℥iv.

F. m. Sig.: Give daily for four or five consecutive days, and follow with an oleaginous laxative.

For Dogs.

WORM MIXTURES.

For puppies up to eight weeks old:

No. 1.	R	Ol. chenopodii ...	...	...	℥ss.
		Ol. terebinth. ...	...	...	℥ss.
		Ol. anisi ...	...	...	℥ss.
		Spts. æth. nit. ...	...	...	℥ss.
		Ol. ricini ...	...	...	℥v.ss.
		Ol. olivæ ...	...	...	℥v.ss.

F. m. Sig.: For a large or medium-sized puppy *under six weeks* give $\frac{1}{2}$ drachm in an equal amount of milk; *at the sixth or eighth week* give 1 drachm; *after eight*

weeks give 1 drachm, to be repeated in an hour. If the bowels do not act in an hour or so, give 1 drachm of castor-oil in a little milk. If no worms are passed, repeat the medicine in two days. In the case of very small breeds of dogs, a quarter of the above doses should be given.

For puppies over eight weeks old :

No. 2.	R	Ol. chenopodii	...	...	̄v
		Santonini	...	...	̄i.
		Chloroformi	...	...	̄ii.
		Spts. æth. nit.	...	...	̄ss.
		Ol. terebinth.	...	...	℥ xlv.
		Ol. anisi	...	...	̄ss.
		Ol. ricini	...	...	̄x.
		Ol. olivæ	...	...	̄iii.

F. m. Sig. : Give 1 drachm in 1 drachm of castor-oil. If no action of bowels in four hours after first dose, give 2 drachms of castor-oil. If no worms are passed, repeat the dose in two hours. *At fourth month* give 1½ drachms; *at tenth month* give 2 drachms; *at thirteenth month* give 3 drachms. Increase the dose by one-half for every three months. For Yorkshire and toy breeds give a quarter of the above doses.

For either Tape or Round Worms.

For adult dogs :

No. 3.	R	Ol. chenopodii	...	...	̄v.
		Thymol	...	...	̄ii.
		Æther. sulph.	...	...	̄v.
		Chloroformi	...	...	̄ii.
		Ol. ricini	...	...	ad ̄viii.ss.

F. m. Sig. : Give from ½ drachm to 2 drachms in an equal amount of castor-oil.

Or :

No. 4.	R	Ol. chenopodii	...	...	̄i.
		Ol. terebinth.	..	...	̄i.
		Chloroformi	..	...	̄ii.
		Ol. ricini	...	...	̄xiv.

F. m. Sig. : Give from ½ drachm to 2 drachms in an equal amount of castor-oil.

For large dogs :

No. 5.	R	Chloroformi	...	...	...	̄i.
		Ol. terebinth.	...	...	...	̄ss.
		Spts. æth. nit.	...	...	...	̄ss.
		Glycerini	...	...	...	̄ss.
		Ol. ricini	...	...	...	̄iii.

F. m. Sig. : Give from 1 to 2 drachms in $\frac{1}{2}$ ounce
castor-oil.

Or :

No. 6.	R	Acidi carbolici	...	...	...	̄ii.
		Chloroformi	...	...	...	̄ii.
		Ol. terebinth.	...	...	...	̄i.
		Ol. ricini	...	...	...	̄xiv.

F. m. Sig. : Give from 1 to 2 drachms in $\frac{1}{2}$ ounce of
castor-oil.

ANTITYMPANITICS.

For Horses.

DRENCHES OR DRAUGHTS FOR CASES OF TYMPANITES.

No. 1.	R	Ol. terebinth.	...	...	...	̄ii. to ̄iv.
		Spts. ammon. aromat.	...	...	...	̄iv.
		Ol. menthæ pip.	...	...	...	̄i.
		Ol. lini	...	...	...	O.i.ss.

F. m. Sig. : Give at once.

No. 2.	R	Cyllin	...	...	...	̄ss.
		Terebeni	...	...	...	̄iv.
		Ol. lini	...	...	...	O.i.ss.

F. m. Sig. : Give at once.

No. 3.	R	Acidi carbolici	...	...	...	̄i.
		Ol. terebinth.	...	...	...	̄ii.
		Spts. ammon. aromat.	...	...	...	̄iv.
		Ol. lini	...	...	...	O.i.ss.

F. m. Sig. : Give at once.

For Cattle.

DRENCHES FOR TYMPANITES.

No. 1.	R	Liq. ammoniæ	...	...	̄i.
		Ol. terebinth.	...	...	̄iv.
		Ol. lini	...	...	O.ii.
	F. m. Sig. : Give at once.				

No. 2.	R	Acidi carbolici	...	...	̄ii.
		Terebeni	...	...	̄iv.
		Liq. ammoniæ	...	...	̄i.
		Ol. lini	...	...	O.ii.
F. m. Sig. : Give at once.					

No. 3.	R	Cyllin	...	...	̄i.
		Ol. terebinth.	...	...	̄iv.
		Liq. ammoniæ	...	...	̄i.
		Tinct. nucis vom.	...	...	̄ii.
		Ol. lini	...	...	O.ii.
F. m. Sig. : Give at once.					

For Dogs.

MIXTURES FOR FLATULENCE.

For Cases of Acid Flatulent Dyspepsia.

No. 1.	R	Liq. bismuthi	...	...	̄i.ss.
		Sodii bicarb.	...	...	̄ii.
		Spts. chloroformi	...	...	̄ss.
		Tinct. calumbæ	...	...	̄vi.
		Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig. : Give from two teaspoonfuls to a table-spoonful every four hours as required.

Or :

No. 2.	R	Tinct. rhei	...	...	̄i.ss.
		Sodii bicarb.	...	...	̄ii.
		Magnesii carb.	...	...	̄ii.
		Spts. ammon. aromat.	...	...	̄vi.
		Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig. : Give from two teaspoonfuls to a table-spoonful every four hours as required.

PILLS.

No. 1. R Thymol gr. ss. to gr. i.
 Pulv. saponis q.s.
 F. pil. i. Sig. : To be given at once.

Or :

No. 2. R Creosoti ℥iv.
 Pulv. saponis q.s.
 M. Div. in pil. viii. Sig. : Give from one to two pills.
 Repeat every four hours if necessary.

ASTRINGENTS.

For Horses.

ASTRINGENT MIXTURES.

No. 1. R Tinct. chloroformi et morphinæ
 co. ̄x.
 Cretæ præp. ̄ii.ss.
 Tinct. gentianæ co. ̄v.
 Aquæ ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in a
 pint of flour-gruel.

No. 2. R Tinct. camph. co. ̄v.
 Tinct. catechu ̄v.
 Spts. chloroformi ̄v.
 Cretæ præp. ̄ii.ss.
 Aquæ ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in a
 pint of flour-gruel.

No. 3. R Acidi carbolic ̄ii.ss.
 Tinct. opii ̄ii.ss.
 Spts. chloroformi ̄v.
 Aq. menth. pip. ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in a
 pint of flour-gruel.

In Cases of Dysentery.

No. 4.	R	Cyllin ...	...	...	...	̄x.
		Vini ipecac. ...	...	...	...	̄v.
		Tinct. opii ...	...	...	...	̄ii.ss.
		Spts. chloroformi ...	...	...	...	̄v.
		Tinct. camph. co. ...	...	...	...	̄v.
		Aquæ ...	...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in a pint of flour-gruel.

For Diarrhœa in Foals.

Commence treatment with a laxative, as follows :

No. 1.	R	Ol. ricini ...	...	...	...	̄i.
		Liq. potassæ ...	...	...	...	̄ss.
		Ol. menth. pip. ...	...	...	...	℥v.
		Aquæ ...	...	...	...	ad ̄ii.

M. F. haust. Sig. : Give at once. For foals over a week old the above may be doubled. If the animal be weak, add 1 ounce of brandy to the draught.

ASTRINGENT MIXTURES FOR FOALS.

No. 2.	R	Pulv. catechu ...	...	...	...	̄iii.
		Cretæ præp. ...	...	...	...	̄iii.
		Spts. ammon. aromat. ...	...	...	...	̄ii.
		Tinct. opii ...	...	...	...	̄i.
		Aquæ ...	...	...	...	ad ̄xii.

F. m. Sig. : Give from half a wineglassful to a wineglassful, with two wineglassfuls of the mare's milk, every four or six hours as required.

Or :

No. 3.	R	Tinct. chloroformi et morphinæ				
		co. ...	...	...	...	̄ss.
		Cretæ præp. ...	...	...	...	̄i.
		Tinct. camph. co. ...	...	...	...	̄ii.
		Aq. menth. pip. ...	...	...	...	ad ̄viii.

F. m. Sig. : Give from half a wineglassful to a wineglassful in $\frac{1}{2}$ pint of flour-gruel every four hours as required.

Should constipation ensue after the above mixtures, give—

R	Ol. ricini	...	...	...	℥i.
	Glycerini	...	...	...	℥ss.
	Ol. menthæ pip.	...	...	...	℥x.
	Aquæ	...	...	...	ad ℥ii.

F. m. Sig. : Give as directed.

For Cattle.

ASTRINGENT MIXTURE.

R	Cretæ præp.	...	...	...	℥iv.
	Tinct. opii	...	...	...	℥v.
	Tinct. catechu	...	...	...	℥v.
	Spts. chloroformi	...	...	...	℥v.
	Aquæ	...	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls three times a day in a pint of flour-gruel.

ASTRINGENT DRENCH.

R	Ext. hæmatoxyli liq.	...	...	...	℥i.
	Cretæ præp.	...	...	...	℥i.
	Spts. chloroformi	...	...	...	℥ii.
	Aquæ	...	...	...	ad O.i.

M. F. haust. Sig. : Give at once in a pint of flour-gruel.
Repeat in six hours if necessary.

Mixture for Diarrhœa in Calves.

R	Pulv. catechu	...	...	...	℥ii.
	Cretæ præp.	...	...	...	℥ii.
	Tinct. opii	...	...	...	℥v.
	Tinct. zingib.	...	...	...	℥ii.ss.
	Aq. menth. pip.	...	...	...	ad O.i.

F. m. Sig. : Give from two to four tablespoonfuls in $\frac{1}{2}$ pint of starch-gruel every four hours as required.

For Dogs.

ASTRINGENT MIXTURES.

- No. 1. R Tinct. catechu $\bar{\text{v}}\text{vi}$.
 Tinct. opii $\bar{\text{v}}\text{i}$.
 Cretæ præp. $\bar{\text{v}}\text{ss}$.
 Aq. menth. pip. ad $\bar{\text{v}}\text{vi}$.
 F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful every four hours as required.
- No. 2. R Sodii bicarb. $\bar{\text{v}}\text{ii}$.
 Spts. ammon. aromat. $\bar{\text{v}}\text{vi}$.
 Tinct. cardamomi co. $\bar{\text{v}}\text{i}$.
 Aq. menth. pip. ad $\bar{\text{v}}\text{vi}$.
 F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful every three hours as required.
- No. 3. R Bismuthi carb. $\bar{\text{v}}\text{ss}$.
 Tinct. camph. co. $\bar{\text{v}}\text{ss}$.
 Cretæ præp. $\bar{\text{v}}\text{ss}$.
 Mucilaginis $\bar{\text{v}}\text{i}$.
 Aq. menth. pip. ad $\bar{\text{v}}\text{vi}$.
 F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful every four hours as required.
- No. 4. R Bismuthi carb. $\bar{\text{v}}\text{ii}$.
 Cretæ præp. $\bar{\text{v}}\text{ss}$.
 Sodii bicarb. $\bar{\text{v}}\text{i}$.
 Liq. opii sed. $\bar{\text{v}}\text{i}$.
 Spts. ammon. aromat. $\bar{\text{v}}\text{vi}$.
 Spts. chloroformi $\bar{\text{v}}\text{ss}$.
 Mucilaginis $\bar{\text{v}}\text{ii}$.
 Aq. menth. pip. ad $\bar{\text{v}}\text{vi}$.
 F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful every three or four hours.

For Obstinate Cases of Diarrhœa in the Dog.

- No. 5. R Acidi sulph. dil. $\bar{\text{v}}\text{iii}$.
 Decocti hæmatoxyli $\bar{\text{v}}\text{iv}$.
 Infusi caryophylli $\bar{\text{v}}\text{iv}$.
 Aq. menth. pip. ad $\bar{\text{v}}\text{x}$.
 F. m. Sig.: Give from two teaspoonfuls to two table-
 spoonfuls three times a day as required.

ASTRINGENT PILLS.

For Diarrhœa depending on a Microbic Origin.

- No. 1. R β -naphthol gr. ss.
 Carbonis ligni grs. ii.
 Ol. menth. pip. ℥ ss.
- F. pil. i. Mitte xii. Sig.: Give from one to four pills
 every four or six hours.
- No. 2. R Bismuthi subnit. grs. ii.ss.
 Pulv. ipecac. co. grs. ii.ss.
- F. pil. i. Mitte xii. Sig.: Give from one to four pills
 three or four times daily.
- No. 3. R Plumbi acet. gr. ss. to grs. ii.
 Pulv. opii gr. $\frac{1}{4}$ to gr. ss.
 Excipient. q.s.
- F. pil. i. Mitte vi. Sig.: Give from one to two pills
 every four or six hours as required.

CATHARTICS.

For Horses.

PURGATIVE BALLS.

- No. 1. R Aloes Barb. \bar{v} .
- Ext. belladonnæ grs. xx.
- Pulv. gentianæ \bar{i} .
- Ol. menth. pip. ℥ xx.
- Excipient. q.s.
- F. bol. i.
- Or:
- No. 2. R Aloes Barb. $\bar{i}v$.
- Hydrarg. subchloridi \bar{v} ss.
- Pulv. gentianæ \bar{i} ss.
- Ol. menth. pip. ℥ xx.
- Excipient. q.s.
- F. bol. i.

Strong Cathartic Ball.

No. 3.	R Aloes Barb.	ʒv. to ʒvi.
	Hydrarg. subchloridi	ʒii.
	Ext. belladonnæ	grs. xx.
	Ol. menth. pip.	℥xx.
	Excipient.	q.s.
F. bol. i.		

PURGATIVE DRAUGHT.

R Hydrarg. subchloridi	ʒii.
Ol. lini	O.i.ss.
F. haust.	

For Cattle.

PURGATIVE DRENCHES.

No. 1.	R Magnesii sulph.	lb. i.
	Pulv. zingib.	ʒii.
	Pulv. anisi	ʒii.
	Theriacæ	lb. i.
	Aquæ	O.iv.

F. haust. Sig. : Give at once.

No. 2.	R Magnesii sulph.	lb. ss.
	Sodii chlor.	lb. ss.
	Pulv. cambogiæ	ʒi.
	Pulv. zingib.	ʒii.
	Theriacæ	lb. i.
	Aquæ	O.iv.

F. haust.

Or :

No. 3.	R Magnesii sulph.	lb. ss.
	Aloes Barb.	ʒi.
	Pulv. cambogiæ	ʒi.
	Pulv. zingib.	ʒii.
	Pulv. anisi	ʒii.
	Theriacæ	lb. i.
	Aquæ ferv.	O.ii.

F. haust.

Or :

No. 4.	R	Ol. crotonis	...	...	...	ʒss.
		Hydrarg. subchloridi	...	...	...	ʒi.
		Ol. lini	...	...	...	O.ii.
		F. haust.				

For Dogs.

PURGATIVE DRAUGHT.

R	Ol. ricini	...	...	...	ʒii. to ʒi.
	Mucilaginis acaciæ	...	...	...	ʒii. to ʒi.
	Spts. æth. nit.	...	...	...	℥x. to ℥xx.
	Syr. rhamni	...	...	...	ʒii. to ʒi.
	Aquæ menth. pip.	...	...	...	ʒii. to ʒi.

M. F. haust.

Or :

PURGATIVE MIXTURE.

R	Ol. ricini	...	...	...	ʒiii.
	Mucilaginis acaciæ	...	...	...	ʒi.ss.
	Syr. aurantii	...	...	...	ʒi.
	Aq. menth. pip.	...	...	...	ʒii.ss.

F. m. Sig. : Give from a dessertspoonful to a wineglassful.

PURGATIVE PILLS.

No. 1.	R	Pil. hydrargyri	...	...	grs. ii.
		Pil. colocynthidis et hyoscyami	...	...	grs. iv.

M. F. pil. i. Mitte ii. Sig. : Give from one to two pills, according to the size of the dog.

Or :

No. 2.	R	Hydrarg. subchloridi	...	grs. ii.
		Pil. colocynthidis et hyoscyami	...	grs. iv.

M. F. pil. i. Mitte ii. Sig. : Give from one to two pills.

Or :

No. 3.	R	Ext. colocynth. co.	...	...	gr. i.
		Ext. jalapæ	...	...	gr. ss.
		Podophylli resinæ	...	...	gr. $\frac{1}{8}$.
		Ext. hyoscyami	...	...	gr. $\frac{1}{4}$.
		Ol. menth. pip.	...	..	gr. $\frac{1}{8}$.

F. pil. i. Mitte ii. Sig. : Give from one to two pills.

Cholagogue Cathartic Pills for the Dog.

No. 1.	R	Podophylli resinæ	...	...	gr. $\frac{1}{4}$.
		Pil. hydrargyri	...	...	gr. $\frac{1}{4}$.
		Ext. nucis vom	...	...	gr. $\frac{1}{15}$.
		Ext. hyoscyami	..	...	gr. $\frac{1}{8}$.
		Oleo-resinæ capsici	...	...	gr. $\frac{1}{8}$.

M. F. pil. i. Mitte ii. Sig.: Give from one to two pills.

Or:

No. 2.	R	Hydrarg. subchloridi	...	gr. i.
		Ext. rhei	...	grs. ii.
		Ext. colocynth. co.	...	grs. ii.
		Ext. hyoscyami	...	gr. $\frac{1}{8}$.

F. pil. i. Mitte ii. Sig.: Give from one to two pills.

Laxatives for the Dog.

No. 1.	R	Ext. cascaræ sagradæ	...	grs. ii.
		Ext. nucis vom.	...	gr. $\frac{1}{20}$.
		Ext. gentianæ	...	q.s.

M. F. pil. i. Mitte xii. Sig.: Give from one to two pills every day as required.

Or:

No. 2.	R	Ext. cascaræ sagradæ	...	grs. ii.
		Ext. nucis vom.	...	gr. $\frac{1}{20}$.
		Ext. belladonnæ	...	gr. $\frac{1}{15}$.
		Ext. gentianæ	...	q.s.

M. F. pil. i. Mitte xii. Sig.: Give from one to two pills once a day as required.

Laxative Mixture (Mistura Alba).

R	Magnesii sulph.	...	...	̄vi.
	Magnesii carb.	...	...	̄i.
	Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to two table-spoonfuls as required.

Liver Pills for the Dog.

R Aloini	gr. $\frac{1}{40}$.
Resinæ podophylli	gr. $\frac{1}{10}$.
Jalapin	gr. $\frac{1}{40}$.
Ext. nucis vom.	gr. $\frac{1}{80}$.
Ext. hyoscyami	gr. $\frac{1}{50}$.
Oleo-resinæ capsici	gr. $\frac{1}{80}$.

F. pil. i. Mitte xii. Sig.: Give from one to four pills twice daily.

Tonic Laxative Pills.

R Ferri carb. sacch.	grs. v. to grs. x.
Aloini	gr. $\frac{1}{20}$.
Ext. gentianæ	q.s.

M. F. pil. i. Mitte xii. Sig.: Give from one to two pills twice daily.

DIURETICS.

For Horses.

DIURETIC MIXTURES.

No. 1.	R Potassii acet.	$\bar{5}$ ii.ss.
	Tinct. digitalis	$\bar{5}$ x.
	Spts. æth. nit.	$\bar{5}$ v.
	Aquæ	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

Or :

No. 2.	R Potassii acet.	$\bar{5}$ ii.ss.
	Spts. æth. nit.	$\bar{5}$ v.
	Liq. ammonii acet. (concent.)	$\bar{5}$ x.
	Aquæ	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

DIURETIC POWDERS.

R Pulv. resinæ	$\bar{5}$ ii.
Potassii nit.	$\bar{5}$ ii.

M. Div. in pulv. vi. Sig.: Give one twice a day in the food.

For Dogs.

DIURETIC MIXTURES.

No. 1.	R Potassii acet.	̄iii.
	Liq. ammonii acet.	̄iv.
	Spts. æth. nit.	̄vi.
	Aquæ camphoræ	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every four hours.

No. 2.	R Potassii acet.	̄ss.
	Tinct. digitalis	̄ii.
	Tinct. scillæ	̄ss.
	Spts. æth. nit.	̄vi.
	Aquæ camphoræ	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful every four hours.

EXPECTORANTS AND RESPIRATORY SEDATIVES.

For Horses.

COUGH MIXTURES.

No. 1.	R Glyco-heroin	̄v.
	Aquæ	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in an equal amount of water, or in the food.

For Asthma and Chronic Cough.

No. 2.	R Glyco-heroin	̄v.
	Potassii iod.	̄v.
	Aquæ	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in $\frac{1}{2}$ pint of water, or in the food.

For Chronic Cough and 'Broken Wind.'

No. 1.	R Liq. arsenicalis	̄v.
	Glyco-heroin	̄v.
	Aquæ	ad O.i.

F. m. Sig.: Give two wineglassfuls in $\frac{1}{2}$ pint of water, or in the food, three times a day.

Or :

No. 2.	R	Liq. arsenicalis	...	...	...	̄v.
		Ext. belladonnæ	...	...	...	̄iii.
		Tinct. camphoræ co.	...	...	...	̄v.
		Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day
in $\frac{1}{2}$ pint of water, or in the food.

COUGH POWDERS.

For Simple Cough.

No. 1.	R	Pulv. camphoræ	...	...	...	̄iii.
		Pulv. fol. belladonnæ	...	...	...	̄i.ss.
		Potassii chlorat.	...	...	...	̄i.ss.
		Pulv. anisi	...	...	...	̄ii.

M. Div. in pulv. vi. Sig.: Give one twice a day in
the food.

For Chronic Cough.

No. 2.	R	Pulv. fol. aconiti	...	...	...	̄vi.
		Acidi arseniosi	...	...	...	̄ss.
		Antim. potass. tart.	...	...	...	̄vi.
		Pulv. anisi	...	...	...	̄ii.

M. Div. in pulv. vi. Sig.: Give one every night in
the food.

For Dogs.

COUGH MIXTURES.

No. 1.	R	Glyco-heroin	...	...	...	̄i.ss.
		Aquæ	...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-
spoonful every four hours.

No. 2.	R	Potassii chlorat.	...	...	...	̄i.
		Liq. ammonii acet.	...	...	...	̄iii.
		Vini ipecac.	...	...	...	̄ii.
		Tinct. camph. co.	...	...	...	̄ss.
		Aquæ chloroformi	...	...	...	ad ̄vi.

F. m. Sig.: Give from two teaspoonfuls to a table-
spoonful three times daily.

MEDICATED INHALATION FOR BRONCHITIS, COUGHS, ETC.

No. 1.	R Terebeni	...	...	...	̄ss.
	Magnesii carb. levis	...	...	...	̄ii.
	Aquæ	...	...	...	ad ̄vi.

M. Sig.: Use two tablespoonfuls in $\frac{1}{2}$ pint of hot water as an inhalation.

Or:

No. 2.	R Ol. eucalypti	...	...	...	̄ii.
	Magnesii carb. levis	...	...	...	̄i.
	Aquæ	...	...	...	ad ̄vi.

M. Sig.: Mix a teaspoonful in a pint of water at 140° F. for each inhalation.

GASTRIC SEDATIVES.

For Horses.

GASTRIC SEDATIVE MIXTURES.

No. 1.	R Ext. belladonnæ	...	...	...	̄v.
	Sodii bicarb.	...	...	...	̄ii.ss.
	Acidi. hydrocyanici (B.P.)	...	...	...	̄iii.
	Bismuthi carb.	...	...	...	̄ii.ss.
	Mucilaginis	...	...	...	̄iv.
	Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

If Pain be a Prominent Symptom.

No. 2.	R Tinct. camph. co.	...	...	...	̄iv.
	Ext. belladonnæ	...	...	...	̄v.
	Spts. chloroformi	...	...	...	̄v.
	Bismuthi carb.	...	...	...	̄ii.ss.
	Mucilaginis	...	...	...	̄iv.
	Aquæ	...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a pint of linseed-tea.

For Cattle.

GASTRIC SEDATIVE MIXTURES.

No. 1.	R	Ext. belladonnæ	...	...	̄x.
		Sodii bicarb.	...	...	̄v.
		Spts. chloroformi	...	...	̄v.
		Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in a pint of linseed-tea.

Useful for Gastritis when Pain is a Prominent Symptom.

No. 2.	R	Ext. belladonnæ	...	...	̄x.
		Liq. opii concent.	...	...	̄x.
		Sodii bicarb.	...	...	̄v.
		Spts. chloroformi	...	...	̄v.
		Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls every four hours in a pint of linseed-tea until pain is relieved.

For Dogs.

GASTRIC SEDATIVE MIXTURES.

No. 1.	R	Sodii bicarb.	...	...	̄ii.
		Magnesii carb.	...	...	̄ii.
		Bismuthi carb.	...	...	̄iii.
		Mucilaginis	...	...	̄i.
		Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig. : Give from two teaspoonfuls to a table-spoonful three or four times daily.

No. 2.	R	Sodii bicarb.	...	...	̄ii.
		Magnesii carb.	...	...	̄ii.
		Bismuthi carb.	...	...	̄iii.
		Acidi hydrocyanici (B.P.)	...	̄i.	
		Mucilaginis	...	...	̄i.
		Aq. menth. pip.	...	...	ad ̄vi.

F. m. Sig. : Give from two teaspoonfuls to a table-spoonful every three or four hours.

When Pain is a Prominent Symptom.

- No. 3. R Bismuthi carb. $\bar{5}\text{ii}$.
 Acidi hydrocyanici (B.P.) ... $\bar{5}\text{i}$.
 Liq. opii sed. $\bar{5}\text{i}$.
 Mucilaginis $\bar{5}\text{i}$.
 Aq. menth. pip. ad $\bar{3}\text{vi}$.

F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful every three or four hours.

Or:

- No. 4. R Liq. bismuthi (B.P.) $\bar{5}\text{vi}$.
 Liq. opii sed. $\bar{5}\text{i}$.
 Spts. chloroformi $\bar{5}\text{iii}$.
 Aq. menth. pip. ad $\bar{3}\text{vi}$.

F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful every three or four hours.

POWDERS.

- No. 1. R Bismuthi carb. $\bar{5}\text{i}$.
 Sodii bicarb. $\bar{5}\text{i}$.
 Magnesii carb. $\bar{5}\text{i}$.

M. Div. in pulv. xii. Sig.: Give from one to two
 powders, placed on the back of the animal's tongue,
 every four hours.

When Persistent Vomiting is a Prominent Symptom.

- No. 2. R Chloretone $\bar{5}\text{ss}$.

Div. in pulv. vi. Sig.: Give from one to two powders,
 placed on the back of the animal's tongue, every
 three or four hours until relief is obtained.

GASTRIC TONICS.

For Horses.

GASTRIC TONIC MIXTURES.

- No. 1. R Tinct. nucis vom. $\bar{5}\text{ii.ss}$.
 Acidi hydrochlorici dil. ... $\bar{5}\text{x}$.
 Tinct. capsici $\bar{5}\text{i}$.
 Tinct. gentianæ co. $\bar{5}\text{v}$.
 Aquæ ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a
 pint of ale.

- No. 2. R Liq. strychninæ ℥v.
 Acidi nitro-hydrochlorici ℥x.
 Tinct. gentianæ co. ℥v.
 Aquæ ad O.i.
- F. m. Sig.: Give two wineglassfuls three times a day
 in a pint of ale.

For Cattle.

GASTRIC TONIC MIXTURE.

- R Ammonii carb. ℥vi.
 Tinct. nucis vom. ℥v.
 Tinct. zingib. ℥v.
 Aquæ ad O.i.
- F. m. Sig.: Give two wineglassfuls three times a day
 in 2 pints of ale.

GASTRIC TONIC POWDERS.

- R Pulv. sinapis ℥vi.
 Ammonii carb. ℥vi.
 Pulv. nucis vom. ℥i.ss.
 Pulv. gentianæ ℥vi.
 Pulv. zingib. ℥vi.
- M. Div. in pulv. vi. Sig.: Give one three times a day
 in 1 pound of treacle and 2 pints of ale.

For Dogs.

GASTRIC TONIC MIXTURES.

- No. 1. R Liq. strychninæ ℥ xxxvi.
 Acidi hydrochlorici dil. ℥ii.
 Tinct. calumbæ ℥vi.
 Syr. aurantii ℥i.ss.
 Aquæ ad ℥vi.
- F. m. Sig.: Give from two teaspoonfuls to a table-
 spoonful three times a day.

No. 2.	R	Pepsini glycerini	...	...	ʒi.ss.
		Tinct. nucis vom.	...	...	ʒi.
		Tinct. capsici	...	...	℥xl.
		Tinct. calumbæ	...	...	ʒvi.
		Syr. aurantii	...	...	ʒi.ss.
		Aquæ	...	...	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

No. 3.	R	Ferri et ammonii cit.	...	...	ʒi.
		Liq. strychninæ	...	...	℥xxxvi.
		Acidi hydrochlorici dil.	..	...	ʒii.
		Syr. aurantii	...	...	ʒi.ss.
		Aquæ	...	...	ad ʒvi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

HÆMATINIC TONICS.

For Horses.

TONIC MIXTURES.

No. 1.	R	Ferri et ammonii cit.	...	...	ʒx.
		Tinct. nucis vom.	...	...	ʒx.
		Tinct. calumbæ	...	...	ʒv.
		Glycerini	...	...	ʒiii.
		Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a pint of ale.

No. 2.	R	Quininæ sulph.	...	...	ʒii.ss.
		Ac. sulph. dil.	...	...	q.s.
		Tinct. ferri perchloridi	..	...	ʒx.
		Tinct. calumbæ	...	...	ʒv.
		Glycerini	...	...	ʒiii.
		Aquæ	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls three times a day in a pint of ale.

TONIC BALL.

R	Quininæ sulph.	...	...	̄ss.
	Ferri sulph. exsicc.	...	...	̄i.
	Pulv. nucis vom.	...	...	̄ss.
	Pulv. gentianæ	...	...	̄ii.
	Theriaca	...	...	q.s.

F. bol. i. Mitte xii. Sig. : Give one twice a day.

TONIC POWDERS.

R	Ferri sulph. exsicc.	...	...	̄vi.
	Sodii bicarb.	...	...	̄ii.
	Pulv. nucis vom.	...	...	̄iii.
	Pulv. gentianæ	...	...	̄i.ss.
	Pulv. anisi	...	...	̄ii.

M. Div. in pulv. vi. Sig. : Give one twice a day in the food.

For Cattle.

TONIC MIXTURE.

R	Tinct. ferri perchloridi	...	...	̄ii.
	Tinct. nucis vom.	...	...	̄v.
	Pulv. gentianæ	...	...	̄ii.ss.
	Pulv. zingib.	...	...	̄iv.
	Aquæ	...	...	ad O.i.

F. m. Sig. : Give two wineglassfuls three times a day in 2 pints of ale and $\frac{1}{2}$ pound of treacle.

TONIC POWDERS.

R	Ferri sulph. exsicc.	...	...	̄ii.
	Magnesii sulph.	...	...	̄xii.
	Pulv. nucis vom.	...	...	̄i.ss.
	Pulv. gentianæ	...	...	̄vi.
	Pulv. carui	...	...	̄iv.

M. Div. in pulv. vi. Sig. : Give one twice a day dissolved in 2 pints of ale and $\frac{1}{2}$ pound of treacle.

For Dogs.

TONIC MIXTURES.

No. 1.	R Ferri carb. sacch.	$\bar{5}$ ss.
	Tinct. nucis vom.	$\bar{5}$ i.
	Tinct. quininæ	$\bar{5}$ vi.
	Tinct. calumbæ	$\bar{5}$ vi.
	Syr. aurantii	$\bar{5}$ ii.
	Aquæ	ad $\bar{5}$ vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

No. 2.	R Ferri et quininæ cit.	$\bar{5}$ ii.
	Syr. aurantii	$\bar{5}$ ii.
	Aquæ	ad $\bar{5}$ vi.

F. m. Sig.: Give from two teaspoonfuls to a table-spoonful three times a day.

TONIC PILLS.

No. 1.	R Ferri redacti	gr. ss.
	Quininæ sulph.	gr. ss.
	Strychninæ sulph.	gr. $\frac{1}{120}$.
	Ext. gentianæ	q.s.

F. pil. i. Mitte xii. Sig.: Give from one to three pills three times a day.

No. 2.	R Pil. ferri	grs. v.
	Acidi arseniosi	gr. $\frac{1}{100}$.
	Strychninæ sulph.	gr. $\frac{1}{100}$.
	Excipient.	q.s.

F. pil. i. Mitte xii. Sig.: Give from one to two pills twice a day.

No. 3.	R Ferri hypophosphitis	grs. ii.
	Quininæ sulph.	gr. i.
	Acidi arseniosi	gr. $\frac{1}{50}$.
	Strychninæ sulph.	gr. $\frac{1}{100}$.
	Excipient.	q.s.

F. pil. i. Mitte xii. Sig.: Give from one to two pills three times daily.

No. 4.	R Ferri sulph. exsicc. ...	...	grs. xxxvi.
	Potassii carb. ...	...	grs. vi.
	Pulv. nucis vom. ...	...	grs. xii.
	Saponis dur. ...	...	q.s.

M. Div. in pil. xii. Sig.: Give from one to two pills
three times a day.

CEREBRAL SEDATIVES.

For Horses.

SEDATIVE MIXTURE.

R Chloral hyd. ...	...	...	ʒii.ss.
Potassii bromidi ...	...	...	ʒiii.
Mucilaginis ...	...	...	ʒiv.
Aquæ ...	...	...	ad O.i.

F. m. Sig.: Give two wineglassfuls every four hours in a
pint of linseed-tea as required.

For Dogs.

SEDATIVE MIXTURE.

R Chloral hyd. ...	...	...	ʒii.
Potassii bromidi ...	...	...	ʒii.
Liq. opii sed. ...	...	...	℥ xl.
Syr. aurantii ...	...	...	ʒss.
Aquæ ...	...	...	ad ʒiv.

F. m. Sig.: Give from a teaspoonful to a tablespoonful
every four hours as required.

SEDATIVE PILLS.

No. 1.	R Chloral hyd. ...	...	...	grs. v.
	Potassii bromidi ...	...	...	grs. v.
	Excipient. ...	...	...	q.s.

F. pil. i. Mitte xii. Sig.: Give from one to three pills
every four hours as required.

No. 2.	R Potassii bromidi	...	...	grs. v.
	Sodii bromidi	...	...	grs. v.
	Ammonii bromidi	..	...	grs. iii.
	Excipient.	...	...	q.s.

F. pil. i. Mitte xii. Sig.: Give from one to three pills three times a day.

ELECTUARIES.

For Horses.

For Laryngitis, Pharyngitis, etc.

No. 1.	R Pulv. camphoræ	...	...	̄ss.
	Pulv. myrrhæ	...	...	̄i.
	Potassii chlorat.	...	...	̄ii.
	Ext. belladonnæ vir.	...	...	̄i.
	Mellis	...	...	̄i.
	Glycerini	...	...	ad ̄viii.

M. F. electuarinum. Sig.: Give from $\frac{1}{2}$ ounce to 1 ounce three times a day on the back of the tongue.

No 2.	R Pulv. camphoræ	...	...	̄iv.
	Pulv. myrrhæ	...	...	̄viii.
	Potassii chlorat.	...	...	̄iv.
	Ext. belladonnæ vir.	...	...	̄ii.
	Pulv. glycyrrh. rad.	...	...	̄viii.
	Theriace	...	...	q.s.

M. F. electuarinum. Sig.: Give from $\frac{1}{2}$ ounce to 1 ounce four times daily.

Sedative Electuary for Tetanus in the Horse.

R	Ext. belladonnæ vir.	...	...	̄ii.
	Potassii bromidi	...	...	̄iv.
	Acidi hydrocyanici dil.	...	...	̄i.
	Glycerini	...	...	ad ̄viii.

M. F. electuarinum. Sig.: Give 1 ounce four times daily on the back of the tongue.

CLEANSING DRENCH FOR COWS.

R	Pulv. ergotæ	...	...	...	℥i.
	Ammonii carb.	...	...	...	℥i.
	Magnesii sulph.	...	...	...	℥xii.
	Pulv. zingib.	...	...	...	℥i.
	Pulv. anisi	...	...	...	℥ii.

M. Sig.: To be given in 2 pints of warm ale, together with 1 pound of treacle and four raw eggs.

COUNTER-IRRITANTS.

Cantharides Blister.

No. 1.	R	Pulv. cantharidis	...	...	℥viii.
		Ol. olivæ	...	...	℥viii.
		Lanolini	...	...	℥viii.

Heat for ten hours in a steam bath, and then add :

		Ceræ flavæ	...	...	℥iv.
		Ol. terebinth.	...	...	℥viii.

M. F. ung.

Or :

No. 2.	R	Pulv. cantharidis	...	...	℥x.
		Ol. terebinth.	...	...	℥vi.
		Acidi acetici	...	...	℥iv.ss.

Mix and heat to 200° F. for a short time, then melt 2½ pounds of lanolin and mix the above constituents therewith.

Red Iodide Blister.

No. 3.	R	Hydrarg. biniod.	...	...	℥ii.
		Ol. olivæ	...	...	℥iv.

Mix well together in a mortar, then melt 1 pound of lanolin and mix the above therewith, blending them together in a mortar until thoroughly incorporated.

For Active Counter-irritation.

No. 4.	R	Ung. cantharidis	...	...	℥i.
		Ung. hydrarg. biniod.	...	...	℥i.

M. F. ung.

For Cattle.

Blister to be applied to the Region of the Throat in Cases of Actinomycosis.

R Hydrarg. biniod.	...	...	℥ss.
Iodi	...	...	℥ss.
Potassii iod.	...	...	℥ss.
Lanolini	...	...	℥iv.

M. F. ung.

LINIMENTS.

ABSORBENT LINIMENTS.

No. 1.	R Iodi	...	...	℥i.
	Potassii iodidi	...	...	℥ii.
	Glycerini	...	...	℥xvi.

M. F. lin.

No. 2.	R Saponis animalis	...	...	℥ii.
	Potassii iodidi	...	...	℥i.ss.
	Glycerini	...	...	℥i.
	Ol. limonis	...	...	℥i.
	Aquæ destillatæ	...	...	℥x.

Reduce the curd soap to fine shreds; mix it with the distilled water and glycerin in a porcelain dish on a water-bath. When the soap is dissolved, pour the liquid into a mortar in which the potassium iodide has previously been powdered, mix by trituration, and continue the latter until the mixture is cold; set aside for an hour, then rub the oil of lemon into the cream-like product. This liniment neither stains nor irritates the skin.

Absorbent Liniment for Reducing Capped Hocks, Thoroughpins, etc.

No. 3.	R Ol. picis rectificati	...	...	℥iv.
	Ol. lini	...	...	℥iv.

M. F. lin. Sig.: Apply to the part with a brush once daily.

STIMULATING LINIMENTS.

No. 1.	R Pulv. camphoræ	...	...	℥i.
	Ol. terebinth.	...	...	℥xiii.
	Saponis mollis	...	...	℥i.ss.
	Aquæ	...	...	℥ii.

Dissolve the camphor in the oil of turpentine, and add gradually to a mixture of the soft-soap in water. Triturate constantly until a cream is produced, then add

Aquæ ad ℥xx.

No. 2.	R Pulv. camphoræ	...	...	℥ss.
	Ol. terebinth.	..	...	℥viii.
	Saponis mollis	...	...	℥ss.

Digest in a wide-mouthed bottle and stir frequently; then pour into a jug, and add

Aquæ ℥iv.

Stir briskly until a thick cream is produced, then add

Liq. ammoniæ fort. ℥iv.

Aquæ ad O.v.

F. lin. This forms a very useful liniment, the constituents of which do not separate. If a stronger liniment is required, more oil of turpentine may be added to the above.

Strong Stimulating Liniment suitable for Cattle.

No. 3.	R Liq. ammoniæ fort.	...	...	℥ii.
	Ol. terebinth.	...	...	℥ii.
	Ol. olivæ	...	...	℥viii.

M. F. lin.

Mild Stimulating Liniment for Strains, etc.

No. 4.	R Tinct. arnicæ	...	...	℥ii.
	Spts. camphoræ	...	...	℥ii.
	Saponis mollis	...	...	℥i.
	Liq. ammoniæ fort.	...	...	℥ii.
	Aquæ	...	...	ad O.i.

M. F. lin.

Liniments for Erythema or Mud Fever.

No. 1. R Liq. plumbi subacetatis fortis ℥ii.
 Glycerini ℥xvi.
 M. F. lin.

Or :

No. 2. R Liq. plumbi subacetatis fortis ℥ii.
 Ol. olivæ ℥viii.
 M. F. lin.

White Liniment for applying after Counter-irritation.

R Potassii carb. ℥ss. or ℥ii.
 Ol. olivæ ... ℥x. „ O.ii.
 Ol. eucalypti ... ℥i. „ ℥ss.
 Aquæ ... ℥x. „ O.ii.
 M. F. lin.

Garget Liniment (useful in the Treatment of Mammitis).

R Ext. belladonnæ vir. ℥ss. or ℥ii.
 Glycerini ... ℥iv. „ ℥xvi.
 Lin. saponis ... ℥vi. „ ℥xxiv.

Linimentum Saponis (Soap Liniment).

R Pulv. camphoræ ℥i.
 Saponis mollis ℥ii.
 Ol. rosmarini ℥iii.
 Spts. rectificati ℥xvi.
 Aquæ ℥iv.

Dissolve the soap in the water, and mix it with the camphor and oil of rosemary dissolved in the alcohol. After a week filter.

Carron-Oil for applying in the Treatment of Burns, etc.

R Liq. calcis ℥x.
 Ol. lini ℥x.
 M. F. lin.

For Dogs.

Liniment for Acute Eczema.

No. 1.	R	Zinci oxidi	...	...	...	℥iii.ss.
		Lanolini	...	...	...	℥ss.
		Liq. calcis	...	...	...	℥iv.
		Ol. olivæ	...	...	...	℥iv.
M. F. lin.						

Skin Liniment for Eczema in Long-coated Dogs.

No. 2.	R	Sulphuris præcip.	...	...	...	℥i.
		Zinci oxidi	...	...	...	℥i.
		Ol. vaselini (white vaseline-oil)	...	...	...	℥viii.
M. F. lin. Perfume with ol. rosæ.						

Skin Liniment for Eczema, etc., in Cats.

No. 3.	R	Sulphuris præcip.	...	...	...	℥i.
		Calaminæ præp.	...	...	...	℥i.
		Glycerini	...	...	...	℥ii.
		Liq. calcis	...	...	...	℥iv.
		Aquæ rosæ	...	...	...	℥iv.
M. F. lin.						

Liniment for Eczema of the Scrotum in the Dog.

No. 4.	R	Liq. plumbi subacet. dil.	...	...	...	℥ii.
		Tinct. opii	...	...	...	℥ii.
		Glycerini	...	...	...	℥ss.
		Aquæ	...	...	...	ad ℥viii.
M. F. lin. Sig. : Apply two or three times daily.						

Liniment for Chronic or Neglected Cases of Canker in the Dog

No. 5.	R	Iodi	...	...	...	℥i.
		Glycerini	...	...	...	℥vi.
M. F. lin. May be diluted with an equal amount of rose-water, or used undiluted.						

PARASITICIDE LINIMENTS.

For Parasitic Mange in the Horse.

No. 1.	R	Sulphuris sub.	...	...	...	℥viii.
		Potassii carb.	...	...	...	℥ii.
		Ol. picis	...	...	...	℥viii.
		Ol. lini	...	...	...	O.ii.
M. F. lin.						

No. 2.	R	Ol. picis	...	...	...	ȳi.
		Sulphuris sub.	...	...	...	ȳi.
		Saponis mollis	...	...	...	ȳii.
		Ol. colzæ	...	...	...	ȳiv.
		Aquæ	...	...	...	ȳx.
M. F. lin. Boil and stir well.						
No. 3.	R	Cyllin...	...	...	...	ȳiv.
		Saponis mollis	...	...	...	ȳiv.
		Spts. vini methyl.	...	...	...	ȳxxxii.
M. F. lin.						
No. 4.	R	Ol. picis	...	...	...	ȳxii.
		Ol. terebinth.	...	...	...	ȳxii.
		Potassæ sulphuratæ	...	...	...	ȳviii.
		Ol. colzæ	..	...	...	O.viii.
M. F. lin.						
No. 5.	R	Picis liquidæ	...	...	...	ȳi.
		Terebinthinæ venetæ	...	...	...	ȳi.
		Saponis mollis	...	...	...	ȳi.
		Spts. vini methyl.	..	...	...	ȳiv.
M. F. lin.						

Liniment for Ear Mange in the Ox.

R	Ol. terebinth.	...	...	ȳi.
	Æther. sulph.	...	...	ȳi.
	Ac. carbolici	...	...	ȳi.
	Ol. olivæ	...	...	ad ȳx.
M. F. lin.				

Liniments for Symbiotic Ear Mange or Parasitic Ear Canker in the Dog.

No 1.	R	Balsami Peruviani	...	...	} āā ȳi.
		Glycerini	...	...
		M.	F. lin.		
No 2.	R	Ol. staphisagriæ	...	...	ȳi.
		Ol. olivæ	...	...	ȳiv.
		M.	F. lin.		
No. 3.	R	Ung. hydrarg. nit. dil.	...	...	ȳi.
		Balsami Peruviani	...	..	ȳiii.
		Ol. olivæ	...	...	ȳv.
		M.	F. lin.		

No. 4.	R	Ol. staphisagriæ	...	...	...	̄̄ii.
		Ac. carbolici	...	...	...	̄̄ss.
		Ol. olivæ	...	...	...	̄̄v.
	M.	F. lin.				

Directions.—After cleansing the ears, pour in a little of any of the above liniments.

Liniment for Generalised Mange in the Dog.

R	Sulphuris sub.	...	...	...	lb. ii.
	Ol. picis	...	...	...	̄̄iv.
	Ol. vaselini (white vaseline-oil)				O. iv.

M. F. lin. Sig.: Dress one-third of the body each day. Do not repeat the dressings until a week has elapsed.

Liniment for Follicular Mange in the Dog.

R	Creosoti	...	...	...	̄̄iv.
	Liq. potassæ	...	...	...	̄̄i.
	Ol. olivæ	...	...	...	̄̄viii.

M. F. lin. Sig.: First shave the affected parts, then apply the liniment; repeat twice weekly, and then at longer intervals when the skin becomes tender. (Hunting.)

Liniments for Ringworm.

No. 1.	R	Iodi	...	...	...	̄̄i.
		Ol. picis rectificati	...	...	...	̄̄iv.

Mix carefully, applying heat if necessary. Ebullition generally takes place by the chemical action between the two agents. Shake the bottle before use. Apply the liniment with a stiff brush to the affected parts. After a scab forms it should be soaked with oil for a few days and removed; the part washed with soap and warm water, then dried, and more of the liniment applied.

No. 2.	R	Ac. carbolici (crystallised)	...	...	...	̄̄ii.
		Tinct. iodi	...	...	...	̄̄ii.
		Chloral hyd.	...	...	...	̄̄ii.

M. F. lin. Sig.: Clip hair, wash parts with soap and water, and dab them with this liniment, taking care to extend a little further than the visible margin of the diseased spot. (Cutler.)

Liniment for Ringworm in Cattle.

R	Cyllin...	...	...	...	℥i.
	Ol. lini	...	...	...	O.i.

- M. F. lin. Sig. : Dress half the body at a time ; wash in two to four days, and reapply. (Pusch.)

Liniment for Open Joint.

R	Hydrarg. perchloridi	...	...	...	℥ii.
	Tinct. myrrhæ	...	...	...	℥xvi.
	Aquæ	...	...	...	℥ii.

- M. F. lin. Sig. : Apply with a camel-hair brush once a day.

Liniment for Erysipelas, Lymphangitis, etc.

R	Ext. belladonnæ	...	...	...	℥ii.
	Liq. plumbi subacet. fortis	...	...	...	℥iv.
	Glycerini	...	...	...	℥iv.
	Aquæ	...	...	...	ad O.ii.

- M. F. lin. Sig. : Apply four times daily.

Local Anæsthetic Liniment for Use prior to the Operation of Firing.

R	Cocainæ hydrochlor.	...	...	...	grs. xxix.
	Ol. caryophylli	...	...	...	℥i.

- M. F. lin. Sig. : Apply to the part with a brush, using friction. This should be done twenty minutes before the operation is commenced. Remove the superfluous oil by means of ether, otherwise it will ignite when the cautery is applied to the skin. (Hartley.)

Liniment to apply after Firing.

R	Ac. tannici	...	...	...	℥i.
	Iodoformi	..	...	...	℥ss.
	Æther. sulph.	...	...	...	ad ℥ii.

- M. F. lin. Sig. : Apply twice daily with a camel-hair brush. (Hartley.)

Iodine Charge or Dressing to be applied to the Limbs after Blisters.

R	Iodi	...	...	...	℥i.
	Picis liquidæ	...	..	...	℥viii.
	Bole Armen.	...	...	...	q.s. to colour.

- M. Sig. : Smear the part with this application twelve hours after the blister has been applied, and reapply every third day. (Hartley.)

Liniment to be applied over the Front of Limbs to prevent the Horse from biting the Fired or Blistered Part.

R	Picis liquidæ ...	...	...	℥vi.
	Spts. rectificati ...	...	...	℥vi.

M. F. lin. Sig.: Paint the front of the shins with the liniment, or apply small amounts over the fired or blistered parts. (Hartley.)

LIQUID SOAP.

For washing Dogs, etc.

R	Saponis mollis (Knight's) ...	lb. i.
	Spts. methylati ...	℥xvi.
	Ol. eucalypti ...	℥i.

M.

The above also forms a useful basis for skin liniments, and agents such as sulphur, cyllin, etc., may be added thereto.

LOTIONS.

Absorbent Lotion for Capped Hock.

R	Hydrarg. biniod. ...	...	℥i.
	Potassii iod. ...	...	℥ss.
	Aquæ ...	...	℥xii.

M. F. lotio. Sig.: Apply once or twice daily until the part becomes scaly and tender, then discontinue and reapply. (Williams.)

Lotion for Fœtid Grease and Chronic Cracked Heels.

R	Plumbi acet. ...	...	℥i.
	Zinci sulph. ...	...	℥i.
	Cupri sulph. ...	...	℥i.
	Aquæ camphoræ ...	...	O.i.

M. F. lotio. Sig.: Soak a bandage in this lotion, and apply by drawing it backwards and forwards on the part until the latter is thoroughly cleaned. Repeat twice daily. Use no ointments until all discharge has ceased.

White Lotion.

R	Plumbi acet. ...	℥i.	or	℥iv.
	Zinci sulph. ...	℥vi.	„	℥iii.
	Aquæ ...	O.i.	„	O.iv.

M. F. lotio.

Cooling Lotion for Strained Tendons, etc.

R	Liq. plumbi subacet. fortis ...	℥iv.
	Spts. rectificati ...	℥i.
	Aquæ ...	ad O.i.

M. F. lotio. Sig.: Soak bandages in this lotion, and apply to affected limbs.

EYE LOTIONS.

No. 1.	R	Ext. belladonnæ vir. ...	℥ii.
		Ac. borici ...	℥i.
		Aquæ laurocer. ...	℥vi.
		Aquæ rosæ ...	ad O.i.

M. F. lotio.

No. 2.	R	Ac. borici ...	grs. lxxx.
		Aquæ laurocer. ...	℥viii.
		Aquæ rosæ ...	ad O.i.

M. F. lotio.

For Opacity of Cornea.

No. 3.	R	Argenti nit. ...	grs. ii. to grs. iv.
		Aquæ destil. ...	℥i.

M. F. lotio. Sig.: Apply with a camel's-hair brush once a day.

Eye-Drops for Keratitis, Iritis, etc.

No. 4.	R	Cocainæ hydrochlor. ...	grs. ii.
		Atropinæ sulph. ...	grs. ii.
		Ac. borici ...	grs. iv.
		Aquæ rosæ ...	℥i.

M. F. lotio. Sig.: Instil a few drops by means of an eye-dropper three times daily.

Astringent Lotion for Chronic Ophthalmia, Purulent and Catarrhal Ophthalmia, Catarrhal Conjunctivitis.

No. 5. R Zinci sulph. gr. i. to grs. ii.
 Aquæ rosæ ʒi.

M. F. lotio. Sig.: May be instilled into the eye four or five times daily.

INJECTIONS.

Intratracheal Injection for Parasitic Bronchitis in Calves.

No. 1. R Ac. carbolicæ ʒiv.
 Ac. hydrocyanici (B.P.) ... ʒiv.
 Ol. terebinth. ʒx.
 Potassii carb. ʒi.ss.
 Ol. olivæ ʒv.
 Aquæ ad ʒxx.

M. Sig.: Administer $\frac{1}{2}$ ounce by intratracheal injection once daily for three consecutive days.

Or:

No. 2. R Lysol ʒiii.
 Chloroformi ʒvii.
 Ol. terebinth. ʒx.
 Potassii carb. ʒi.ss.
 Ol. olivæ ʒv.
 Aquæ ad ʒxx.

M. Sig.: Administer $\frac{1}{2}$ ounce as above directed.

Dean's Injection for the Treatment of Bog-spavin.

No. 1. R Hydrarg. perchlorid. .. grs. xx.
 Spts. methylati ʒi.

M.

No. 2. R Tinct. iodi decoloratæ ... ʒi.

Sig.: Mix together 1 drachm of each of the above, and inject this amount after withdrawing the synovia. For successful results, Dean's combined aspirator and injector should be employed. No air should be admitted into the part, and aseptic precautions should be observed. One injection is usually sufficient.

Injection for the Production of Local Anæsthesia.

R	β -eucaine	...	...	...	grs. iv. $\frac{3}{4}$.
	Adrenalin chloride (takamine)				gr. $\frac{1}{100}$.
	Aquæ destil.	..	....	...	\bar{z} i.

M. Sig.: Inject hypodermically from 10 to 20 minims at different points in the region to be rendered anæsthetic.

Cocaine Injection for the Diagnosis of Lameness in the Horse.

No. 1.	R Sol. cocainæ hydrochlor. (6 per cent.)	̄ii.
--------	--	-----	-----	-----	------

Sig. : Inject half into the region of the plantar nerves at each side of the limb, just above the fetlock.

Schleich's Solution for the Diagnosis of Lameness.

No. 2.	R Cocainæ hydrochlor.	gram. 0·2	or	grs. iii.
	Morphinæ hydrochlor.	„ 0·025	„	gr. $\frac{3}{8}$.
	Sodii chlor.	„ 0·2	„	grs. iii.
	Aquæ destil. ...	grammes 100	„	℥iii.

M. Sig.: Inject 3 drachms on each side above the fetlock over the region of the plantar nerves.

Normal Saline Solution for injecting either Subcutaneously or by Intravenous Injection.

Prepared by dissolving 1 drachm of sodium chloride in 1 pint of boiled water. Some authorities advise 75 to 78 grains to the pint.

OINTMENTS.

Antiseptic.

B	Iodoformi	...	...	...	§ii.
	Ac. borici	..	...	...	§ii.
	Ol. eucalypti	...	...	...	§i.
	Lanolini	...	...	...	lb. ss.
	Vasellini	...	...	...	lb. ss.

M. F. ung.

APPENDIX

Ointment for Cracked Heels and Slight Grease.

No. 1.	R	Plumbi acet. ...	...	...	℥iv.
		Plumbi carb. ...	...	...	℥iv.
		Pulv. camphoræ ...	...	...	℥ii.
		Ol. eucalypti ...	...	...	℥ii.
		Lanolini ...	...	...	lb. i.ss.

M. F. ung. Melt the lanolin, then add the two salts of lead, and heat so as to combine the constituents ; add the camphor and the oil of eucalyptus, and blend thoroughly in a mortar. Colour with Armen. bole.

No. 2.	R	Zinci oxidi ...	..	...	℥iv.
		Calaminæ præp. ..	..	..	℥ii.
		Sulphuris sub. ...	...	...	℥ii.
		Ac. borici ...	...	..	℥ii.
		Ol. eucalypti ...	...	...	℥i.
		Lanolini ...	...	...	lb. ss.
		Vaselini ...	...	..	lb. ss.

M. F. ung. Melt the lanolin and vaseline, add the eucalyptus-oil, mix the zinc salts, sulphur, and boric acid together, and blend thoroughly the entire constituents in a mortar. Colour with Armen. bole.

Absorbent Ointments.

No. 1.	R	Potassii iod. ...	...	...	℥ii.
		Lanolini ...	...	...	lb. i.

M. F. ung. Powder the potassium iodide finely ; melt the lanolin, and thoroughly incorporate both in a mortar. Colour with Armen. bole.

No. 2.	R	Iodi ...	...	...	℥i.
		Potassii iod. ...	...	...	℥i.
		Lanolini ...	...	...	lb. i.

M. F. ung. Mix as directed above.

Ointment for the Treatment of Mallenders and Sallenders.

R	Ung. hydrarg. ammoniati (B.P.)	lb. ss.
	Cyllin ...	...

M. F. ung. Sig. : Apply twice a day.

Hoof Ointment, for the Treatment of Brittle Feet, etc.

R	Picis liquidæ	...	...	...	lb. i.
	Ceræ flavæ	...	...	...	lb. i.
	Mellis	...	...	...	lb. i.
	Glycerini	...	...	...	℥xii.
	Lanolini	...	...	...	lb. iii.
	Vaselini	...	...	...	lb. iii.

- M. F. ung. Melt the lanolin, vaseline, and beeswax together, then stir in the other ingredients, and blend thoroughly. (Miles.)

Ointments for the Treatment of Ringworm in the Horse.

- No. 1. R Iodi ℥i.
Potassii iod. ℥i.
Lanolini ℥viii.
- M. F. ung. Sig.: Apply every third day.
- No. 2. R Hydrarg. ammoniati ℥ii.
Lanolini ℥iv.
Vaselini ℥iv.
- M. F. ung. Sig.: Apply every second day.
- No. 3. R Ac. carbolicæ ℥i.
Lanolini ℥v.
Saponis mollis ℥v.
- M. F. ung. Sig.: Apply every second day.

For Dogs.*Ointment for Acute Eczema in the Dog.*

R	Zinci oxidi	...	...	...	℥ii.
	Calaminæ præp.	...	...	...	℥ii.
	Ac. salicylici	...	...	...	℥ss.
	Lanolini	...	...	...	℥viii.
	Vaselini	...	...	...	℥viii.

- M. F. ung. Sift the zinc salts thoroughly; melt the basis, and blend in a mortar. Scent with ol. rosæ, and colour with carmine. Sig.: Apply twice daily.

Ointment for Eczema, Mange, etc., in Small Pet Dogs.

R	Zinci oxidi	...	...	...	℥i.
	Sulphuris præcip.	...	...	...	℥i.
	Balsami Peruviani	...	...	...	℥ss.
	Ol. staphisagriæ	...	...	...	℥ss.
	Lanolini	...	...	...	℥vii.
	Vaselini	...	...	...	℥i.

M. F. ung. Melt the basis with the balsam of Peru, and stir in the other ingredients. Sig. : Apply once daily.

Ointment for Follicular Mange, Chronic Eczema, Sarcoptic Mange.

R	Zinci oxidi	...	...	...	℥ii.
	Sulphuris sub.	...	...	...	℥ii.
	Ac. salicylici	...	...	...	℥ii.
	Styrax præp.	...	...	...	℥ii.
	Lanolini	...	...	...	℥viii.
	Vaselini	...	...	...	℥viii.

M. F. ung. Sift the zinc and sulphur finely; melt the styrax, vaseline, and lanolin together, and add the other ingredients; stir until set. Afterwards rub well up in a mortar to thoroughly incorporate the ingredients, and to give the whole mass a homogeneous appearance.

Sig. : Clip the dog, and apply the ointment to one-third of the body one day, another third another day, and the other third the day following. Use friction when applying. Continue the treatment daily until the disease disappears. Do not wash. Keep the dog warm, especially during cold, wet, or damp weather. Feed well on stimulating food, such as meat. Give from $\frac{1}{40}$ to $\frac{1}{20}$ grains of arsenious acid in the food every morning and evening. The above ointment is perfectly safe and most effectual.

Ointments for Obstinate Cases of Chronic Eczema.

No. 1.	R	Ung. hydrarg. ammoniati	...	℥i.
		Ung. zinci oxidi (1 in 6)	...	℥iii.
		Glycerini	...	℥ii.

M. F. ung.

Or :

No. 2.	R	Ung. hydrarg. nit. dil.	...	...	...	℥i.
		Cyllin	...	...	...	℥ss.
		Lanolini	...	...	...	℥x.

M. F. ung.

N.B.—Both of the above ointments require to be used with great caution in consequence of containing mercurials.

Ointment for Eczema Dorsi (frequently met with in Aberdeen Terriers).

R	Zinci oxidi	...	...	...	...	℥i.
	Picis liquidæ	..	...	...	...	℥i.
	Ung. hydrarg.	...	...	...	...	℥i.

M. F. ung. Sig. : Apply every third or fourth day.

Ointment for Ophthalmia Tarsi, Corneal Ulceration, and all Forms of Conjunctival Inflammation, also for Eczema affecting the Eyelids.

R	Ung. hyd. oxidi flavi (1 in 50)	...	...	...	...	℥i.
	Vaselini	...	...	...	...	℥i.

M. F. ung. Sig. : Insert portion of ointment about the size of a hemp seed within the lower eyelid every night.

THE LUMINOUS HEAT BATH IN VETERINARY PRACTICE *

MR. CHARLES HARTLEY, F.R.C.V.S., Lincoln, has employed luminous heat in the treatment of various affections in horses and dogs with marked success, and has devised a special apparatus for its application. The heating arrangement in the apparatus consists of luminous electric heaters fixed on reflecting surfaces of special construction, the latter being arranged so as to diffuse the reflected heat and light rays from the luminous source and project them in any given direction. The heat is under perfect control by means of a special regulator, and can be increased or diminished in a moment. These heaters are inserted in the sides of what otherwise looks more or less like an ordinary horse-box, with folding doors opening at both ends, secured by a cross-bar on the outside. The horse is led in at the back end, or may be backed in from the top end. The man at his head steps through the open doors at the head of the box, closing them behind him, the doors at the other end being at the same time closed. An asbestos-lined rug is then drawn over the top of the box, and this rug, being slit at one end, falls on each side of the horse's neck, and is fastened by a light strap above and below. Thus the body of the animal only is in the box for treatment, and the head not being included, he breathes fresh air freely. The wooden shutters are drawn aside from the radiators, the electric current is turned on, and the heat and light at once become effective. The thermometer may mark from 250° F. to 350° F., according to the case in hand.

The temperature that an animal will bear, and the readiness with which diaphoresis may be produced, vary in different animals within a very wide range. The looseness of the covering over the box secures automatic ventilation, and thus prevents the air becoming saturated with moisture, the absence of moisture being a *sine quâ*

* From a paper on 'The Luminous Heat Bath in Veterinary Medicine,' read before the Lincolnshire Veterinary Association, October, 1899, by C. Hartley, F.R.C.V.S.

non where high temperatures are to be endured. Sweat, although abundantly produced, may only partly become visible, as in such a high, dry temperature the greater part of it is volatilised immediately it is formed.

A slide for observation purposes is placed in the side of the box, and a thermometer is fixed in a convenient position, so that the index can be read outside the box.

For dogs a special form of apparatus has been devised.

Mr. Hartley has found the luminous heat treatment of marked value in cases of pulmonary congestion, pneumonia, chills, and in other affections of the respiratory and abdominal organs, also in rheumatism, etc.

When it is desirable to concentrate the heat and light rays on any particular portion of the body, a 'localiser' is employed. This consists of a movable radiator, which can be held in the hand or fixed on a stand and placed close to the affected region.

The luminous heat bath has also been found very valuable for the purpose of improving a horse's condition by the agency of sweating without damaging the legs or exhausting the animal.

The advantages of this form of bath over the ordinary Turkish bath are that a far higher temperature can be borne without inconvenience or danger, and also that the animal is enabled to breathe pure air, as the head is placed outside the bath. The heat from luminous radiation is more penetrative, more perfectly under control and more rapid in its action than that obtained by any other method, and as there is no combustion, there is no contamination of the atmosphere.

In canine practice the bath is valuable in cases of spinal affections, rheumatism, skin diseases, respiratory affections, etc.

REMARKS ON VENESECTION, OR BLOOD- LETTING, AS A THERAPEUTICAL MEASURE

IN the present day venesection is seldom practised, and the only affections in which it is occasionally employed are acute pulmonary congestion and acute cerebral affections, such as encephalitis and meningitis. In the early stages of very severe pulmonary congestion (see p. 585) moderate venesection is advised by some authorities, in order to relieve the pressure in the pulmonary vessels, the vena cava, and the right side of the heart.

In encephalitis and meningitis venesection is advised in the early stages (see p. 551), and is said to exert a favourable influence by lessening the blood-pressure in the cerebral and meningeal vessels.

In former times blood-letting was employed as a routine treatment in every disease. With the advance of pathological knowledge and more accurate clinical observation, the indiscriminate practice of venesection was found to be not only useless, but distinctly detrimental, in therapeutics. Local blood-letting has also fallen into disuse.

For general blood-letting, the jugular vein is selected, at the junction between its upper and middle thirds in the neck. The safest instrument to employ is the fleam, but in an emergency a lancet may be used. For details of the operation and the precautions necessary, the student is referred to works on veterinary surgery.

The amount of blood which may be taken varies from 6 to 8 pints; but in severe cases of encephalitis some authorities advise that even larger quantities may be removed with advantage. Of course, this will depend on the effect which is produced on the pulse.

In the later stages of the disease, when the pulse is feeble, venesection is contra-indicated, and only hastens the fatal termination.

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